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AGRICULTURAL RESEARCH INSTITUTE
PUSA

INTERNATIONAL INSTITUTE OF AGRICULTURE

BULLETIN OF THE BUREAU OF AGRICULTURAL INTELLIGENCE AND OF PLANT-DISEASES

3rd YEAR — NUMBER 1

JANUARY 1912

ROME, 1912 — PRINTED AT THE INSTITUTE'S PRINTING OFFICE

PREFACE

With this number the Bulletin of Agricultural Intelligence and of Plant Diseases enters its third year.

With a view to increasing the utility of this Bulletin, the Permanent Committee has made regulations on the following points.

1. Inclusion in No. 1 of 1912 of a list of all the publications regularly reviewed by the Staff. This list will be continued in succeeding numbers when any fresh publications are added.

2. Modification of the arrangement of subjects in the Bulletin.

On the new plan the abstracts are grouped under six main headings in each section of the Bulletin. As may be seen by reference to the Contents in this Number, the object of this arrangement is to facilitate reference to the Bulletin and to emphasize the importance of certain branches, which have been accorded special headings, such as " Rural Economy " and " Legislative and Administrative Measures dealing with Agriculture and Industries depending on it. "

3. The date of publication of the Bulletin has been fixed as follows:

In French on the 1st of each month.
In Italian on the 10th of each month.
In English on the 20th of each month.

These dates will not be changed so long as the Bulletin is only published in these three languages.

The Department will be grateful to any readers who will furnish information tending to improve the Bulletin.

THE INTERNATIONAL INSTITUTE OF AGRICULTURE

The International Institute of Agriculture was established under the International Treaty of June 7th, 1905, which was ratified by 40 Governments. Ten other Governments have since adhered to the Institute.

It is a Government Institution in which each Country is represented by delegates. The Institute is composed of a General Assembly and a Permanent Committee.

The Institute, confining its operations within an international sphere, shall:

a) Collect, study, and publish as promptly as possible statistical, technical, or economic information concerning farming, vegetable and animal products, the commerce in agricultural products, and the prices prevailing in the various markets;

b) Communicate to parties interested, also as promptly as possible, the above information;

c) Indicate the wages paid for farm work;

d) Make known the new diseases of vegetables which may appear in any part of the world, showing the territories infected, the progress of the diseases, and, if possible, the remedies which are effective;

e) Study questions concerning agricultural co-operation, insurance, and credit in all their aspects; collect and publish information which might be useful in the various countries for the organisation of works connected wrth agricultural co-operation, insurance and credit;

f) Submit to the approval of the Governments, if there is occasion for it, measures for the protection of the common interests of farmers and for the improvement of their conditions, after having utilized all the necessary sources of information, such as the wishes expressed by international or other agricultural congresses or by congresses of sciences applied to agriculture, or agricultural societies, academies, learned bodies, etc.

The Institute publishes: *a*) a Bulletin of Agricultural Statistics; *b*) a Bulletin of Agricultural Intelligence and Diseases of

Plants; *c*) a Bulletin of Economic and Social Intelligence; *d*) a Bulletin Bibliographique hebdomadaire (published every Saturday).

It has also published a volume on " The Organization of Agricultural Statistical Services in the Several Countries ", and a volume on " Statistics of Cultivated Areas and of Vegetable and Animal Production in the Adhering Countries " (an Inventory drawn up from documents published by Governments), and " Monographs on Agricultural Association in Various Countries (2. Vol) ".

Officers of the Institute and List of the Delegates to the Permanent Committee.

President: Marquess RAFFAELE CAPPELLI, *Delegate of Italy*

Vice-President : M. LOUIS-DOP, *Delegate of France.*

Vice-General Secretary: Prof. GIOVANNI LORENZONI

Delegates of the adhering States to the Permanent Committee.

	States adhering to the Institute	Groups in which adhering States are classified	Names and Rank of the Delegates
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4	**Hungary**	I	E. DE MIKLÓS DE MIKLÓSVAR, Secretary of State for Agriculture. Member of the House of Magnates.
5	**Belgium**	IV	O. BOLLE.
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7	**Bulgaria**	III	D. RIZOFF, Minister plenipotentiary of Bulgaria to H. M. the King of Italy.
8	**Chile**	I	S. ALDUNATE BASCUÑAN, Minister plenipotentiary of Chile to H M. the King of Italy.
9	**China**	I	TCHAO-HI-TCHOU, Secretary to the Chinish Legation to the Italian Government.
10	**Costa-Rica** . . .	V	R. MONTEALEGRE, Minister plenipotentiary of Costa-Rica to H. M. the King of Italy.
11	**Cuba**	V	C. M. DE CESPEDES Y QUESADA, Minister plenipotentiary of Cuba to H. M. the King of Italy.

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13	**Ottoman Empire**	I	Dr. Mehmed Djémil Bey.
14	**Egypt**	II	B. Chimirri, Delegate of Eritrea and Italian Somaliland.
15	**Ecuador**	V	A Norero, Minister plenipotentiary of Ecuador to H M. the King of Italy.
16	**Spain**.	I	Enrique Rodriguez de Celis Agricultural Engineer.
17	**United States** .	I	David Lubin.
18	**Ethiopia**	V	Prof. G. Cuboni, Director of the Station of Plant Pathology of Rome.
19	**France**	I	Louis-Dop, Vice-President of the Institute.
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21	**Tunis**	V	Louis-Dop, Delegate of France.
22	**Great Britain and Ireland**	I	H. G. Dering, Counsellor to the British Embassy to the Italian Government.
23	**Australia** . . .	IV	H. G Dering, Delegate of Great Britain and Ireland.
24	**Canada**	II	H. G. Dering, Delegate of Great Britain and Ireland
25	**British India** .	II	H G. Dering, Delegate of Great Britain and Ireland
26	**New Zealand** .	IV	H. G. Dering, Delegate of Great Britain and Ireland.
27	**Mauritius** . .	V	H. G. Dering, Delegate of Great Britain and Ireland.
28	**Union of South Africa**	IV	. . . .
29	**Greece**	IV	B. Intrigila, Consul General of Greece at Rome.
30	**Italy**	I	Marquess R. Cappelli, Vice-President of the Chamber of Deputies, President of the Institute.
31	**Eritrea and Italian Somaliland**	IV	B. Chimirri, Member of Parliament.

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32	**Japan**	I	NAOTOSHI MARUMO, First Secretary to the Imperial Japanese Embassy to the Italian Government.
33	**Luxemburg** . . .	V	O. BOLLE, Delegate of Belgium.
34	**Mexico**	II	G A. ESTEVA, Minister plenipotentiary of Mexico to H. M. the King of Italy.
35	**Montenegro** . . .	V	G. VOLPI, Director General of the Monopolies of the Kingdom.
36	**Nicaragua**. . . .	V	V. E. BIANCHI, Consul General of Nicaragua at Rome.
37	**Norway**.	IV	Dr G. FJELSTAD, Agricultural proprietor.
38	**Paraguay**	V	Prof ORAZIO COMES, Director of the High School of Agriculture at Portici.
39	**Holland**	IV	H. DE WEEDE, Minister plenipotentiary of Holland to H. M. the King of Italy.
40	**Peru**	V	Dr. M. M. MESONES.
41	**Persia**	IV	A. DEL GALLO, Marquess of ROCCAGIOVINE.
42	**Portugal**	IV	LUIZ FILIPPE DE CASTRO, Professor of the Agronomic Institute at Lisbon.
43	**Roumania** . . .	I	. . . .
44	**Russia**	I	His Excell. G. ZABIELLO, Counsellor of State, Consul General of Russia at Rome.
45	**Salvador** . . .	V	A. BALLO, Acting Consul General of Salvador at Genoa.
46	**San Marino** . .	V	His Excell. L. LUZZATTI, Minister of State of the Kingdom of Italy.
47	**Servia**	III	B. I. SOUBOTITCH, Secretary to the Servian Legation to the Italian Government.
48	**Sweden**	IV	Baron C. N D. DE BILDT, Minister plenipotentiary of Sweden to H. M. the King of Italy.
49	**Switzerland** . .	IV	J. B. PIODA, Minister plenipotentiary of Switzerland to H. M. the King of Italy.
50	**Uruguay** . . .	V	REQUEÑA BERMUDEZ, Chargé d'affaires of Uruguay to the Italian Government

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Miss FLORENCE M MAC IVER and Dr. A. BRODRICK BULLOCK are provisionally attached to the Bureau as English translators.

The information contained in some of the abstracts dealing with Canada has been most kindly placed at the disposal of the Institute by the Government of the Dominion.

The Canadian abstracting is by Mr. J. K. Doherty, the able chief of the Canadian Bureau of Correspondence with the International Institute of Agriculture.

List of Periodicals reviewed by the Bureau of Agricultural Intelligence and of Plant Diseases.

ARGENTINA.

Boletin del Ministerio de Agricultura.
Boletin del Ministerio de Relaciones Exteriores y Culto.
El buen Agricultor.
Gaceta rural, mercantil e industrial.
Paginas Agricolas.
Revista Horticola.
Revista de la Sociedad rural de Cordoba.
Revista vitivinicola Argentina.
The Review of the River Plate.

AUSTRALIA AND NEW ZEALAND.

Agricultural Gazette of Tasmania.
Agricultural Gazette of New South Wales.
Bulletin of the Department of Intelligence.
Journal of the Dept of Agric. of South Australia.
Journal of the Dept. of Agric. of Victoria.
Journal of the New Zealand Dept. of Agric.
Monthly Meteorological Report of the Australian Commonwealth.
The Pastoralists Review.
Producers' Review.
Queensland Agricultural Journal.
Review of Reviews for Australasia.

AUSTRIA.

L'Agricoltore.
L'Agricoltore Goriziano.
Allgemeine Holz- und Forst-Zeitung.
Allgemeine Wein-Zeitung.
Alpenländische Agrar-Zeitung.

Archiv für Chemie und Mikroskopie.
Beilage zu Fricks Rundschau.
Bukowinaer landwirtschaftliche Blätter.
Bulletin Int. de l'Académie des Sciences.
Centralblatt für das gesamte Forstwesen.
Der deutsche Imker aus Böhmen.
Der deutsche Landwirt.
Deutsche Rundschau für Geographie.
Gospodarski Vjensnik.
Das Handelsmuseum.
Illustrierte Monatsblätter.
L'Istria agricola.
Jahrbuch der k. k. Geologischen Reichsanstalt.
Land- und Forstwirtschaftliche Mitteilungen.
Land- und Forstwirtschaftliche Unterrichts-Zeitung.
Landwirtschaftliche Mitteilungen für Steiermark.
Land- und Volkswirtschaftliche Mitteilungen.
Letacek.
Listy Cukrovarnicke.
Mitteil. der Fachberichterstatter des K. K. Ackerbauministeriums.
Mitteil. des K. K. Ackerbauministeriums uber Pferdezuchtangelegenheiten.
Mitteilungen des K K. Technologischen Gewerbemuseums.
Mitteil. des vorarlbergischen Landwirtschaftsvereins an seine Mitglieder.
Monatshefte fur Landwirtschaft.
Oesterreichische Agrar-Zeitung.
Oesterreichische Botanische Zeitschrift
Oesterreichische Fischerei-Zeitung.
Oesterreichische Forst- und Jagdzeitung
Oesterreichische Gartenzeitung.
Oesterreichische Molkerei-Zeitung.
Oesterreichische Monatsschrift fur den Orient
Oesterreichische Moorzeitschrift.
Oesterreichisch-Ungarische Viehverkehrs-Zeitung.
Oesterreichisch-ungarische Zeitschrift für Zuckerindustrie und Landwirtschaft.
Oesterreichische Vierteljahresschrift (Fruher Monatsschrift) für Forstwesen.
Rolnika.
Sitzungsberichte der Kais. Akademie der Wissenschaften in Wien
Stallmist und Kunstdunger.
Vereinsschrift fur Forst- Jagd- und Naturkunde.
Verhandlungen der K K Geologischen Reichsanstalt.
Wiener Landwirtschaftliche Zeitung.
Zeitschrift für das landwirtschaftliche Versuchswesen.
Zeitschrift für Moorkultur etc.
Zeitschrift für Zuckerindustrie in Böhmen.
Zentralblatt für das Gewerbliche Unterrichtswesen in Oesterreich.
Zentralblatt für Landwirtschaft.

BELGIUM.

Annales de Gembloux.
Annales de Médecine Vétérinaire.
Belgique horticole et agricole.
Bulletin de l'Administration de l'Agriculture.
Bulletin agricole du Congo Belge.
Bulletin de l'Agriculture et de l'Horticulture.
Bulletin officiel du Congo Belge.
Bulletin de la Société centrale forestière de Belgique.
Bulletin de la Société chimique de Belgique.
Bulletin mens. de la Société Royale horticole et agricole de l'arrondissement de Huy.
Bulletin du Temps.
Chasse et Pêche.
Chine et Belgique.
L'Industrie laitière belge
Japon et Belgique.
Journal des Sociétés agr. du Brabant & du Hainaut.
Journal de la Société centrale d'agriculture.
Journal de la Société Royale agricole.
La Laiterie Belge.
Laiterie et Elevage.
De Landbode
Moniteur horticole belge.
L'Outillage agricole.
Le Progrès agricole belge.
Renseignements de l'Office Col. (Min. des colonies).
Revue économique internationale.
Revue générale agronomique.
Revue générale du Lait.
Revue de l'Horticulture belge et étrangère.
Revue des Questions scientifiques.
La Sucrerie Belge.

BRAZIL.

Boletim de Agricultura.
Chacaras & Quintaes.
O Criador Paulista.
Diario official - Meteorologia.
A Evoluçao agricola.
A Lavoura. Boletim da Sociedade nacional de Agricultura.

BULGARIA.

L'Agriculture. Organe de la Société agric. bulgare.
Bulletin mensuel de l'Institut météorol. central de Bulgarie.
Sadowo. Revue des Sciences agr. etc.

CANADA.

Canadian Bee Journal.
Canadian Entomologist.
Canadian Poultry News.
Farmer's Advocate.
Grain Grower's Guide.
Journal d'Agriculture et d'Horticulture.
Monthly Weather Review.
Revue Canadienne.
Weather Map.
Weekly Globe and Canada Farmer.

CHILE.

Anales Agronomicos.
Anales de la Sociedad agronomica de Chile.
Boletin de la Sociedad de Fomento Fabril.

COSTA RICA.

Boletin de Fomento.
Revista Economica.

CUBA.

Boletin del Centro nacional del Fomento etc. de Cuba.
Boletin oficial de la Secretaria de Agricultura Comercio y Trabajo
Boletín oficial de la Secretaria de Agricultura.

DENMARK.

Ugeskrift for Landmaend.
The Danish Export Review.
Hedeselskabets Tidsskrift.

Maanedlige Oversigter over Sygdomme hos Landbrugets Kulturplanter.
Maanedsoversigt over Vejrforholdens. Meteor. Institut.
Tidsskrift for Landbrugets Planteavl.
Tidsskrift for Skovvaesen.

ECUADOR.

Gaceta municipal Actas de las Sesiones efectuadas etc.
El Tiempo.

EGYPT

Agricultural Journal of Egypt.

FRANCE.

L'Agriculture commerciale, franç., colon., et étrangère.
L'Agriculture pratique des pays chauds.
L'Agronome.
Annales de la Brasserie et de la Distillerie.
Annales de l'Ecole nationale d'Agriculture de Montpellier.
Annales de l'Ecole nationale d'Agriculture de Rennes
Annales de Géographie
Annales de l'Institut Pasteur.
Annales de la Science Agronomique
Annales des Sciences naturelles
Annales de la Société d'Agriculture
Annales de la Société entomologique de France.
Annales de la Société des Viticulteurs de France.
L'Apiculteur.
L'Argus des Revues.
L'Arriège agricole.
Bulletin Agricole et Viticole de la Charente.
Bulletin de l'Association agricole et viticole de la Marne.
Bulletin de l'Association des Chimistes de Sucrerie et de Distillerie de France et des Colonies.
Bulletin du Laboratoire régional d'Entomologie agricole.
Bulletin mens. de l'Association Amicale des Anciens Elèves de l'Institut nation. agronomique.
Bulletin mens. de l'Association intern. du Froid.
Bulletin mens. de l'Office intern. d'Hygiène publique.
Bulletin mens. de l'Office des Renseignements agric. du Ministère d'Agriculture
Bulletin mens. de la Société centrale d'Agriculture, d'Horticulture, etc

Bulletin mens. de la Société de Géographie commerciale de Paris.
Bulletin de l'Office Colonial.
Bulletin Scientifique et industr. de la Maison Roure-Bertrand Fils.
Bulletin des Séances de la Société nationale d'Agriculture de France.
Bulletin de la Société des Agriculteurs de France.
Bulletin de la Société Botanique de France.
Bulletin de la Société d'Encouragement de l'Industrie Nationale.
Bulletin de la Société d'Etudes et de Vulgarisation, de la Zoologie.
Bulletin de la Société d'Horticulture et de Viticulture d'Eure et Loire.
Bulletin des Soies et des Soieries.
Bulletin de la Société des Viticulteurs de France.
La Champagne Viticole.
Comptes-rendus hebd. des Séances de l'Académie des Sciences.
Comptes-rendus de la Société de Biologie.
La Conserve Alimentaire.
Les Documents du Progrès.
L'Echo forestier.
L'Engrais.
Feuille d'Informations du Ministère de l'Agriculture.
Gazette du Village.
La Géographie. Bull. de la Société de Géographie.
L'Industrie du beurre.
L'Industrie laitière.
Le Jardin.
Journal d'Agriculture pratique.
Journal d'Agriculture Tropicale.
Journal des Fabricants de Sucre
Journal Officiel.
Journal de Pharmacie & de Chimie.
Journal de la Société nationale d'Horticulture de France.
La Meunerie française.
Moniteur d'Horticulture.
Moniteur Scientifique.
La Nature.
Le Progrès agricole et viticole.
Questions diplomatiques et coloniales.
La Quinzaine coloniale.
Revue agricole, viticole et horticole des Régions du Centre, de l'Est et du Sud-Est.
Revue d'aviculture technique et commerciale.
La Revue de Chimie industrielle.
Revue des Eaux et Forêts.
Revue générale de Botanique.
Revue générale de Chimie Pure et appliquée.
Revue générale du Froid.
Revue générale des Sciences.
Revue Horticole.

Revue de Madagascar.
Revue Scientifique.
Revue Vétérinaire.
Revue de Viticulture.
Sucrerie indigène et coloniale.
Station viticole de Cognac (Notes mensuelles).
La Vie agricole et rurale.

FRENCH COLONIES

Bulletin agric. de l'Algérie et de la Tunisie.
Bulletin de la Direction de l'Agriculture, du Commerce et de la colonisation.
Bulletin économique de la Colonie de Madagascar.
Bulletin mensuel de l'Office du Gouvernement Tunisien.
Office du Gouvernement général de l'Algérie. Bulletin bi-mensuel.
Revue Tunisienne.

GERMANY.

Allgemeine Fischerei-Zeitung.
Allgemeine Forst- und Jagdzeitung.
Annales Mycologici.
Berichte der Deutschen Botanischen Gesellschaft.
Biedermann's Zentralblatt für Agrikulturchemie und rationellen Landwirtschaftsbetrieb.
Biochemische Zeitschrift.
Blätter für Zuckerrübenbau.
Botanisches Centralblatt.
Bulletin Semestriel de la Maison Schimmel & Co.
Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten.
Centralblatt für die Zuckerindustrie.
Chemiker-Zeitung.
Chemisches Zentralblatt.
Deutsche Geographische Blätter.
Deutsches Colonialblatt.
Deutsche Kolonialzeitung.
Deutsche Landwirtschaftliche Presse.
Deutsche Landwirtschaftliche Rundschau.
Deutsche Landwirtschaftliche Tierzucht.
Deutsche Rundschau.
Deutsche Zuckerindustrie.
Die Ernährung der Pflanze.
Export.

Forstwissenschaftliches Centralblatt.
Fühling's Landwirtschaftliche Zeitung.
Geisenheimer Mitteilungen.
Gummi-Zeitung.
Illustrierte Landwirtschaftliche-Zeitung.
Jahrbuch für Gesetzgebung etc. (Schmoller).
Journal für Landwirtschaft.
Kali.
Kühn-Archiv.
Der Kulturtechniker.
Das Land.
Landwirtschaftliche Jahrbücher.
Landwirtschaftliches Jahrbuch für Bayern.
Landwirtschaftliche Maschinen & Geräte.
Landwirtschaftliche Umschau.
Die landwirtschaftlichen Versuchsstationen.
Landwirtschaftliche Zeitschrift für die Rheinprovinz.
Maschinen-Zeitung.
Milchwirtschaftliches Zentralblatt.
Milch-Zeitung.
Mitteilungen der Deutschen Landwirtschafts-Gesellschaft.
Mitteilungen aus den deutschen Schutzgebieten mit Benutzung amtlicher Quellen herausgegeben von Dr. Freiherr von Danckelman.
Mitteilungen des Deutschen Weinbauvereins.
Mitteilungen des Kaiser Wilhelm Instituts fur Landwirtschaft in Bromberg.
Mitteilungen des Landwirtschaftlichen Instituts (Breslau).
Mitteilungen der Landwirtschaftskammer für das Herzogtum Gotha.
Mitteilungen der Centralstelle der preussischen Landwirtschaftskammern.
Mitteilungen uber Weinbau und Kellerwirtschaft.
Naturwissenschaftliche Zeitschrift fur Forst- und Landwirtschaft.
Niederschlagsbeobachtungen-Baden
Obst-Gartenbau- und Bienen Zeitung für Westfalen und Lippe.
Der Pflanzer.
Dr. Petermanns Mitteilungen.
Poradnik Gospodarski.
Aus dem Posener Lande.
Praktische Blätter für Pflanzenbau & Pflanzenschutz.
Rheinische Monatsschrift für Obst- & Gartenbau.
Silva. Illustrierte Forstzeitung.
Tharander Forstliches Jahrbuch.
Der Tropenflanzer.
Übersicht der Ergebnisse der meteorol. Beobachtungen-Baden.
Verhandlungen der Baumwoll-Kommission.
» » Kolonial-Technischen Kommission.
» » » Wirtschaftlichen Komitees.
Weinbau.
Weinbau und Weinhandel.

Westpreussische landw. Mitteilungen.
Wirtschaftliche Mitteilungen.
Wochenschrift für Brauerei.
Zeitschrift für Agrarpolitik.
Zeitschrift für angewandte Chemie & Zentralblatt für technische Chemie.
Zeitschrift für Forst- u. Jagdwesen.
Zeitschrift für das gesamte Getreidewesen.
Zeitschrift für induktive Abstammungs- & Vererbungslehre.
Zeitschrift für das ländliche Fortbildungsschulwesen in Preussen.
Zeitschrift der Landwirtschaftskammer für das Herzogtum Braunschweig.
Zeitschrift für Pflanzenkrankheiten.
Zeitung für Spiritus- & Stärke-Industrie.
Zeitschrift für Untersuchung der Nahrungs-& Genussmittel.
Zeitschrift des Vereins der deutschen Zuckerindustrie
Ziemanin.

GREAT BRITAIN & IRELAND

Agricultural Economist.
Agricultural Gazette.
Agricultural Record.
The Analyst.
Annals of Botan .
Board of Trade Journal.
Bulletin of Entomological Research.
Bulletin of the Imperial Institute of the United Kingdom.
Chemical News.
The Chemist and Druggist.
Cold Storage and Produce Review.
Dairy and Creamery Journal.
The Dairy World & the British Dairy Farmer.
Farmer and Stock Breeder & Chamber of Agr. Journal.
Fruit, Flower and Vegetable Trades' Journal.
Gardeners' Chronicle.
Geographical Journal.
Illustrated Poultry Record.
Imperial & Asiatic Quarterly Review.
Implement & Machinery Review.
International Sugar Journal.
Journal of Agricultural Science.
Journal of the Board of Agriculture.
Journal of the Chemical Society.
Journal of the Dept. of Agric. and Technical Instruction for Ireland.
Journal of Genetics.
Journal of the Institute of Brewing.

Journal of the R. Anthropological Institute.
Journal of the R. Horticultural Society.
Journal of the Royal Institute of Public Health.
Journal of the Royal Society of Arts.
Journal of the Society of Chemical Industry.
Journal of Tropical Medecine & Hygiene.
Live Stock Journal.
Mark Lane Express.
Mendel Journal.
Monthly Agricultural Report - Board of Agric. & Fisheries.
Monthly Weather Report.
Nature.
North British Agriculturist.
Quarterly Journal of Forestry.
Science Progress in the 20th Century
Scottish Farmer.
The Times.
Transactions of the R Scottish Arboricultural Society.
Tropical Life.
United Empire - The Royal Colonial Institute Journal.
Weekly Weather Report of the Meteorological Office.
Westminster Review.
Wine Trade Review.

BRITISH COLONIES.

Agricultural News (Barbados).
Bulletin of the Dept. of Agric. Bahamas.
Journal of the Board of Agriculture of British Guiana.
Journal of the Jamaica Agricultural Society.
Rhodesian Agricultural Journal.
Tropical Agriculturist & Magazine of the Ceylon Agricultural Society
West Indian Bulletin.

GREECE.

Georgikon Deltion.

HUNGARY

Akadémiai Ertesito
Erdészeti Lapok.
Földtani Kölzlony.
Köztelek.
Magyar Figyelö.
Revue de Hongrie.

INDIA (BRITISH).

Agricultural Journal of India.
Fort St. George Gazette.
Government Gazette - The United Provinces of Agra and Oudh
The Indian Agriculturist.
Indian Daily Weather Report.
The Indian Forester.
Memoirs of the Dept. of Agric. in India. - Botanical Series
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L'Agricoltura coloniale.
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» » » (Index)
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The Rural Californian.
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The Survey.

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the month of November-December 1911.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES DEALING WITH AGRICULTURE AND INDUSTRIES DEPENDENT ON IT.

1 Steps Taken by the French Government to Guard against the Effects of the Growing Increase in the Price of Meat.

— *Bull .Mens. de l'Assoc. Intern. du Froid,* 2e Année, Nos. 18-19-20, pp. 223-226. Paris, Juillet-Août-Sept,, 1911.

France

The question of the growing increase in the price of provisions and particularly of meat is engaging attention in all countries. Measures have been taken in France to remedy this state of affairs. An Interministerial Commission appointed for this purpose has prepared a report which formed the basis for these measures.

According to the Commission, the rise in meat prices is due:

1. To the fact that butchers fail to utilise an animal fully;
2. To the increase in general expenses;
3. To the growth in consumption;
4. To the change in the taste of consumers.

In this connection it is interesting to note that the best quality pieces of meat bear the burden of the loss subtained by butchers, owing to the fact that the other parts, little valued, only fetch very low prices when sold to the retail butchers. On the other hand the consumers are getting accustomed to younger and younger meat, and their demands lead to the slaughter of the animals before they have reached full growth.

The Commission considered the following points for alleviating the effect of these inevitable causes: alteration of the customs tariff; modification of the sanitary regulations; trade in cold stored meat; importation of colonial cattle; market regulations, town dues and transport rates.

The Government has decided to take the following measures:

1. To import colonial cattle, obtaining oxen chiefly from Senegal, and Madagascar, and sheep from New Caledonia;
2. To import certain classes of foreign cattle, either alive or as refrigerated or chilled meat;
3. To allow to frigorific installations which fulfil the conditions laid down by the regulations, the benefit granted to goods in entrepot;
4. To adopt measures calculated to facilitate the access to the interior markets. of agricultural produce and fresh fish. The weight of postal packages of agricultural produce conveyed by railway may be increased from 10 to 40 kilogrammes.

2

Austria

Budget for 1912 of the Ministry of Agriculture in Austria. (Das Budget des Ackerbauministeriums). — *Landwirtschaftliche Mitteilungen*, No. 22, Seite 355. Graz, 16. Nov. 1911.

The Austrian Minister of Agriculture has set down the following expenditure in his 1912 Budget.

	Crowns
Central Administration	1 883 199
Experimental Institutions and Stations	922 469
Agricultural development	1 600 000
Agricultural defensive measures . . .	1 872 243
Forestry	72 930
Horse breeding	7 286 500
Veterinary service	4 713 323
State forest properties	15 586 953

The total of expenses provided for amounts to 61 467 307 Kronen, instead of 59 345 024 in the previous year.

Among general expenses, stress must be laid on those having for their object to alleviate the rising price of food, to stimulate co-operation and to meet the ravages of phylloxera.

To agricultural education there is a larger sum appropriated.

For further developments on rational systems of State properties and forests, a sum nearly half a million in excess of that of the previous year is allocated.

For improving agriculture generally, 4 150 000 Kronen (1) have been allotted, and no less than 6 050 000 for the development of breeding.

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(1) Austrian Krone = 10*d*.

Importation of Plants, Bees and Exotic Animals into South Africa(1).

The Journal of the Board of Agriculture. Vol.XVIII, No. 8, pp. 689-690. London, November, 1911.

The laws in force in the various States of the Union of South Africa relating to the importation of plants, bees, and exotic animals have been consolidated by the Government of the Union in the *Agricultural Pests Act*, 1911, of which Sections 8 to 13 deal with the importation of plants, and Sections 21 to 23 with the importation of bees and exotic animals.

Plants may be introduced into the Union from oversea countries by post, or through the ports of Cape Town, Durban, East London, and Port Elizabeth, or other place which may be described as a port of entry by proclamation of the Governor-General.

The importation of Eucalyptus, Acacia, and coniferous plants, fresh grapes, and peach stones is prohibited. In the case of any other plants the importer must obtain a permit from the Department of Agriculture, which permit may limit the number of articles to be introduced thereunder to 10 rooted plants or 100 cuttings of one variety. No permit is, however, required for fruit, bulbs, tubers, vegetables, such portions of plants as cannot be propagated, and such herbaceous plants as may in the future be specified by the Minister of Agriculture. The following articles, in addition to requiring a permit, must be imported under the supervision of an officer of the Department of Agriculture, and under such precautions as the Department may in each case prescribe:—

Grape vines and other plants of the family *Vitaceæ*; sugar canes; plants cultivated for the production of rubber; tea plants, and cotton seeds.

All plants together with the material in which they are packed, may be examined by an officer of the Department of Agriculture, for the purpose of discovering whether an insect pest or plant disease is present. This officer may order disinfection or other such treatment as is prescribed by the Department, the costs of such treatment being chargeable to the consignee, and in certain cases also the destruction of the plants affected. The consignee may be asked to furnish particulars of any parcel of plants imported, such as name and address of consignor, number and kind of the packages, names, quantities, varieties, and grade marks of the plants, and place of origin of each of such plants.

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(1) Cf *Bull.* Nov.-Dec. 1911 Abstr. 3280. (*Ed.*).

The importation of bees, their larvæ or eggs, and used apiaries and apiary appliances is prohibited, and the Governor-General is empowered to prohibit the introduction into the Union of any kind of exotic animal.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

4 PELKA. **Italian Agriculture Generally and Tuscan Agriculture in Particular.** (Europe-Italy-Florence). — *Berichte der k. k. Oesterr.-Ung. Konsularämter,* Jahrgang 1911, S. 1-13. Wien, Oktober 1911.

Italy According to a recent official enquiry of the Italian Ministry of Agriculture, Italian husbandry wealth is estimated at 7 thousand million francs. This figure should not seem excessive if allowance be made for the enormous growth undergone by agriculture in that country in consequence of the extensive works of improvement and reclamation carried out throughout the Peninsula, and the immense spread of the use of chemical fertilisers.

In 1910 Italy imported 57 million francs worth of raw materials for the manufacture of chemical manure.

Agricultural machinery, which formerly all came from abroad, is now manufactured to a fairly large extent in Italy. Nevertheless in 1910 Italy imported agricultural implements to a total value of 215 000 000 francs·

The total area under cultivation in Italy is 26 269 500 hectares (64 911 400 acres) of which 2 758 600 (6 816 600 ac.), are under wheat. Italy is nevertheless still compelled to import about 10 million quintals (1 million tons) of wheat, because, though in Upper Italy an excellent yield in proportion to the sowing is obtained, as much cannot be said for Lower Italy and the Islands.

Italy generally, and Tuscany in particular, produces little rye. Barley is chiefly grown in Sicily, Apulia and Sardinia. Maize is losing ground more and more in favour of other crops, such as tobacco, sugar beet and market gardening. Rice is only grown, and that in a continually lessening quantity, in the provinces of Milan, Novara, Pavia and a few others. Beans, peas, lentils and potatoes are cultivated here and there throughout Italy.

Natural grass lands in Italy cover an area of 1 431 800 ha. (3 538 000 ac.) and artificially irrigated grass lands (such as the " Marcite " in Lombardy) an area of 2 210 000 ha (5 470 000 ac.).

Floriculture has undergone considerable expansion of late years. the production in 1910 reaching 5 000 000 fr. in value. Austria-Hungary imports one half; the remainder goes to Germany, England and Switzerland. In the province of Florence the culture of the iris is especially noteworthy; at Verona likewise this flower is grown on a smaller scale. The roots are exported abroad (about 6 000 qls. or 600 tons) for distilling perfume.

The vintage in 1910 throughout Italy did not exceed 48 000 000 qls., (4 800 000 tons) as against 96 112 000 (9 611 200 tons) in 1909.

In Italy there exist about 600 000 ha. (1 500 000 acres) of chestnut wood with a minimum yield of 10 qls. per ha. (8 cwt, per ac.) and a minimum price of 10 fr. per ql. (4s. per cwt.). The richest regions from this point of view are the provinces of Sondrio and Cuneo, Calabria and Tuscany. The demand for chestnut wood is becoming more and more pronounced in the furniture-making industry and for the manufacture of tannin; consequently there is the prospect that the nut production will decline continuously.

The cultivation of the broom Sorghum is very widespread in the country round Florence and Rieti (Umbria). The demand for brooms is so considerable that the production of broom Sorghum in Tuscany and Umbria is not sufficient, and it has to be imported from Hungary. The town of Prato exported 23 000 qls. (2 300 tons) of brooms, of which 17 000 qls. (17 00 tons) went abroad.

The excellent Italian cattle do not suffice for the continually growing consumption, so that in 1910, in addition to cold-stored meat from Argentina, live cattle had to be imported from Austria-Hungary and above all Servia.

BLAKEN. **Progress of Agriculture in Russia.** — *Diplomatic and Consular Reports*, No. 4781, pp. 1-104, London, Sept. 1911.

With respect to agriculture it may be said that many larger estates, the farms of the German colonists in south Russia, and of the richer Cossack peasants are well managed.

Amongst the peasants, however, their widespread poverty, their ignorance and indolence, have sadly hampered improvement, and largely account for the periodic failures of harvest and frequently for the inferior quality of the exported grain. The Government and public institutions are now giving the peasant effective help. By being freed from the village community he gains the incentive of private ownership of his land, and the Peasants' Agrarian Bank helps him to purchase land to be worked as an indipendent small farmstead; the co-operative and credit associations give him the credit necessary to purchase seed, cattle, implements; and, lastly, the introduction of better agricultural machinery and improved methods of agriculture all help him forward.

The Zemstvos are doing useful work in their farms or testing fields, where the peasants see the concrete results of better farming and of better seed grain. Seeds are sold by the Zemstvos, where formerly the peasants used their own inferior grain. Seed-cleaning and sorting machines are supplied to villages on hire. Lectures, frequently with limelight pictures, teach peasants how to increase the yield of their farms; show them the advantages of the five years' rotation of crops instead of the wasteful three years' rotation of winter grain, oats and fallow; and teach them the use of better types of implements and the proper cultivation of the soil.

Large tracts of fertile soil in Russia lie in a semi-arid zone, where the rainfall between spring sowing and harvest is very small, and the excessive heat and winds rapidly dry the soil. The proper development of the grain largely depends upon the possibility of retaining the moisture in the soil or of drawing upon the reserve of water below the surface.

The American Campbell method is being largely adopted here. It consists in deep ploughing, in pressing down the lower surface of the furrow by means of a special type of wheeled roller or "subsoil packer", to increase the capillary action from the damp earth towards the roots of the grain.

Both immediately after ploughing, and as long as possible after sowing, the surface is kept in a pulverised state by means of harrows and cultivators, so as to stop the capillary action near the surface and thus to retard evaporation. The grain is sown in rows, about 7 inches apart, so as to facilitate the cultivation of the soil between the rows during the early part of the summer. Sometimes the rows are sown in narrow, 4-inch pairs, with 14 inch spaces between the pairs, for cultivation.

Much less seed grain is thus used, and the grain is stronger and more abundant than with the usual method of sowing, and well repays the extra labour. Special machines for this system of cultivation are finding an increasing sale.

A simplified method more easily carried out by the poorer peasants, if the five years' rotation of crops is adopted, is the ploughing down of the stubble immediately after the harvest for the spring sowing, or in early spring for winter grain, and keeping the fallow " black " viz., with pulverised surface and free of weeds. Stubble gives here the necessary grazing land, but favours the growth of weeds and withdraws moisture and strength from the soil. For keeping a " black " fallow the peasants must, therefore, provide special land for sowing green fodder, which is possible in the five years' rotation of crops.

Another method, that has however not generally given satisfactory results, has been developed by Mr. Demtshinsky. He adopts the Chinese practice of transplanting the young grain, and setting it deeper into the soil, in order to get two or three successive rows of roots to develop out of the knots in the stem. In test cultures the results are stupendous, each seed producing a bushlike bunch of stems and widespread strong roots; but in practice, where instead of setting the plants deeper, the earth is heaped on to the young stems, it is generally found that the time is ill spent. Special sowing machines are manufactured for this method of planting, but they have rarely been used, and only for experimental purposes.

Artificial manure, formerly only used on sugar beet farms, is now being largely used for grain, and special types of combined sowing machines, have been made; these are also being exported from Russia to Austria-Hungary and Roumania. The system generally used in Western Europe of scattering artificial manure broadcast is not suited for this dry climate, where the moisture is insufficient to dissolve the chemicals, which are wasted. Here the practice is to sow the manure in the rows with the seed, and, if possible, below the seed furrow in the damper earth.

The increasing use of improved threshing machines will help the more rapid gathering in of the harvest and the export of grain, before the autumn rains make the roads impassable.

The practice of stacking the grain in the villages, instead of threshing straight from the fields, causes heavy losses, as the wet often impairs the quality.

The better organisation and wiser financing of the grain trade, will be a further factor that must be taken into consideration, together with the improved methods of agriculture here summarised, in estimating the future value of Russia as a grain exporting country.

6 E. BANSE. **Deserts, Steppes, Woods and Oases of the Near East.** (D Wüsten, Steppen, Wälder und Oasen des Orients). *Deutsche Run schau für Geographie*, XXXIV Jahrgang, 1 Heft, S. 25-31 2 Heft, S. 58-66; 3 Heft, S. 97-109; Wien 1911.

The East is divided, not only from a topographical, but likewis from a climatological point of view, into two great parts. Th Asiatic East is dry but with many « islands » of rainfall. Th African East is throughout the year under the action of air currents from the North.

The East is divided into three rainfall-zones from the point o view of vegetation: forest or humus land, steppe, and desert.

Asia. Africa

Throughout the East, owing to the climate, the formation o humus is only possible on 12 or 15 % of the soil. All the remainde of the territory can only produce low vegetation or can be turned to account for agriculture only by dint of irrigation. If allowance be made for the water, roads and pebbly soils, we arrive at the result that only 10 % of the area of the East is covered with humus soil; this limits the region once covered by woods which cannot occur without considerable rainfall.

The steppe zone might be fertile but has not a sufficiency of water for the formation of humus; long droughts form the determining condition for steppe.

In the desert there is no vegetation because there is never the slightest wet period.

In North Africa there are four wooded regions where ordinary cultivation is possible: the coast zone of Morocco, the Algerian and Tunisian coast, Cyrenaica and the Delta of Egypt. In Asia the zone of culture is the zone called the Anatolian-Armenian-West Persian zone.

Northern Africa has three steppe zones, northern, southern, and eastern; the first is that of the Atlas Mountains and the Syrtis of Marmora, the second that of the Sudan and the third that of Erythrea. In Asia there are two steppe zones: in the north the Aro-mongolian and in the south the Arabian zone.

The north African desert forms a single compact area: the Sahara and the Lybian desert. The desert of nearer Asia on the contrary is divided into two parts. the Arabian and the Iranian desert.

The Atlas comprises two wooded and cultivated zones, separated by a strip of steppes. The first, the West Moroccan zone, possesses a very fertile black soil adapted to all kinds of cultivation without needing irrigation. The second is the Algerian-Tunisian zone. The area of the wooded and cultivated zone in Morocco is 122 000 sq. kilometres (47100 sq. m.) (31 % of Morocco), that of Algeria 120 000 sq. km. (46 300 sq. m.) (43 %), and that of Tunisia 49 000 sq. km. (19 000 sq. m.) (64 %). In the Atlas zone almost the whole of the surface consists of steppes, part of which—in Morocco and Algeria—produces Esparto and is adapted to the raising of sheep, etc.

The steppe in Morocco covers 262 000 sq. km. (101 100 sq. m.), in Algeria 154 000 (59 400 sq. m), and in Tunisia 28 000 (10 800 sq. m). The whole of the desert in the Atlas zone does not exceed 14 000 sq. km. (5400 sq. m.).

The region of the Sahara is distinguished by its desert character; steppes of varying extent intersect it. Cyrenaica and the Delta of the Nile alone have a vast zone of humus, bearing rich vegetation. Here and there wooded and brushwood zones exist, as in the north of Tripoli. The whole of the wooded area covered with humus in the Sahara zone does not exceed 198 000 sq. km (76 400 sq. m) or 2 % of the total surface; the zone of the Nile possesses 38 000 sq. km. (14 670 sq. m), that of Cyrenaica 25 000 (9650 sq. m.), and Tripoli 33 000 (12 700 sq. m). In Cyrenaica 31 % of the area belongs to the wooded and cultivated zone and only 10 % in Tripoli. Fezzan possesses 7 500 sq. km. (2 900 sq. m.) of cultivable land.

In the Sahara region the steppe zone is very extensive, covering 3 308 000 sq. km. (1 277 000 sq. m) - 37 % of the entire area - there are 107 000 sq. km. (41 300 sq. m) of steppes in Egypt, 207 000 (79 900 sq. m) in Nubia and 54 000 (20 800 sq. m) in Cyrenaica. In Tripoli 254 000 sq. km (98 000 sq. m) of steppe form one of the best pasturages in the East. Fezzan possesses 12 500 sq. km of steppe and Thibesti 35 000.

The north African desert is the Sahara with an area of 5 392 000 sq. km. (2 081 312 sq. m) of which 384 000 (148 200 sq. m.) in Egypt; in Nubia 317 000 (122 350 sq. m) and in Tripoli 48 000 (18 530 sq. m), Fezzan 374 000 (144 400 sq. m).

The humus area in Syria is 30 000 sq. km. (11 580 sq. m) and in Mesopotamia 33 000 (12 740 sq. m); the centre and south of Mesopotamia are devastated by the river waters and only the Tamarisk grows there.

The cultivable land in Sinai is 600 sq. km. (230 sq. m.) and in Arabia 114 000 (44 000), of which 80 000 (30 900) are in the Yemen.

In Asia the steppes are distributed as follows: Sinai 18 000 sq. km. Syria 156 000 sq. km. (60 200 sq. m); Mesopotamia 291 000 sq. km. (112 300 sq. m); and Arabia 1 885 000 sq. km. (727 800 sq. m).

Arabia is, of all the countries of the East we are dealing with, the one best adapted for grazing live stock.

Asia Minor possesses 345 000 sq. km. (133 200 sq. m) of wooded and cultivable soil, Armenia 154 000 (59 440 sq. m) and Iran 231 000 (89 170 sq m). The steppes are particularly extensive in Iran where we find 2 053 000 sq. km. (792 460 sq. m) while Anatolia has only 175 000 (67 550) and Armenia 216 000 (83 380).

In this part of the East the desert is no more important than in the Atlas region. This part of the Orient, called Arian, is chiefly steppe, which covers 71 % of the total surface. The condition of mind of its inhabitants is such that the steppe forms a greater obstacle than the desert itself to the introduction of civilization.

As regards the oecology of the East, it may be remarked that evergreen wood occupies the first place in the Atlas zone, and predominates completely in the Sahara zone and Arabia, assuming in the Yemen a tropical character.

Well-developed summer-green wood is found only in Northern Anatolia, Armenia, the northern parts of the Elburz Mts., and perhaps the Zagros and Northern Afghanistan.

With regard to the true grass lands, they are only found in the part of the Orient we are dealing with along streams. The steppes may be classed as grassy, stony, salt, brushwood-covered and desert. The grassy steppe covers flat moist soils; the brushwood steppe presents fairly good pasture land. In the stony steppe there is grass and brushwood. The salt steppe forms during drought, on soils adjoining waters, which cover them occasionally or periodically. Its extent in comparison to those previously mentioned is not considerable. The desert steppe is called in Algeria the "little desert" and is often covered with bushes and thorns.

Vegetation is possible in the desert only on mountains and by watercourses or springs; here it may be either natural or planted by man.

7 CHICK (Brit. Cons. at Bushire). **Possibilities of Agricultural Exports from Southern Persia.** — *The Board of Trade Journal*, No. 783, pp. 432-433. London, Nov. 30, 1911.

Persia

There are still no signs of the economic development of the southern provinces of Persia, and the improvement of methods of transport by mechanical means has become a real necessity, both to increase commerce and to promote greater security in the provinces.

It is on the export of agricultural produce also that traders in the southern provinces should rely for a recovery from the evil times into which foreign trade has fallen; by increasing the buying power of the tribal people and cultivators, a greater demand for imports would be sure to result. The coastal belt, which is anything from 15 to 60 miles in breadth, is, wherever sufficiently fertile, given over to the cultivation of grain, but the rainfall is the principal factor governing the possibility of exportation each year. Across the mountains, however, a harvest can almost always be relied upon, and yet, though the quantity produced at present is so far above the needs of the cultivators that a considerable amount is usually set fire to, high rates and dearth of animal transport make it impossible to get a pound of this to the coast for export.

Besides grain there are certain berries and wild nuts, which would be of interest for vegetable oils, and other products such as vegetable silk, awaiting the advent of European discovery; for Persian traders are both unaware of possible commercial uses to which produce may be put, and further, are never willing to try experiments. Unfortunately, little pioneer work or specialisation has been done so far by European firms settled in the country. The only exception is gum tragacanth, the purchase and sorting of which has become systematised to a certain extent in Shiraz Almonds, raisins and sultanas, linseed, sesame and Persian tombaku should all repay firms undertaking purchases on a large scale from the districts where each is cultivated

Even now there are signs of a dawning demand for simple machinery, agricultural instruments, and flour mills.

All development of agriculture, of the internal trade, and of improved communications are, however, largely contingent on port improvements.

The Agricultural Position in Indo-China. (Official Report) (La situation agricole en Indo-Chine). — *Bulletin de l'Office Colonial*, 4e Année, No. 46, pp. 339-359. Melun, Octobre 1911. 8

In *Cochin China* the cultivation of rice is the principal occupation of the majority of tillers of the soil. In the province of Bentré, an interesting experiment in artificial irrigation has been carried out by means of a hand pump, placed by the Administration at the disposal of private persons, who can thus effectively combat drought and even irrigate some hectares of rice field. **Indo-C**

Similar experiments are about to be undertaken in other regions. The Indo-China Rice-Growing Association continued to conduct interesting trials of agricultural machinery. The natives themselves are strongly interested in this question. For Cochin China a small, light reaper, not complicated, should be built, able to work both in mud and on dry lands.

The Administration of Canthe has successfully undertaken trials of early Japanese rice.

Special mention should be made of the endeavours to cultivate the cocoanut tree, which are at present being undertaken in the province of Cocong by some colonists. The cultivation of maize, sugar cane, betel nut, coffee, indigo, tobacco, mulberry, and fruit trees, continues normally. At Giadinh more than anywhere else the tobacco has yielded excellent results. Hevea plantations have multiplied and grown everywhere. Applications for concessions or purchase of land with a view to growing rubber trees continue to pour in.

At *Tonking* a revival of agricultural activity must be recorded. In the province of Thai-Nguyên, the restoration of order and the constantly growing demand of the markets supplying the important mining centres of this Province, have induced growers to revert to the culture of lands which had been abandoned for some years. The movement for extending the cultivation of maize which has characterised recent years appears to be slackening in the Delta, but it is gaining ground rapidly in the mountain region, which, for that matter, is better suited for it than the plain.

Food crops occupy a very important position in Tonkinese agriculture during the entire cool season. The growing of French vegetables becomes an ordinary practice, not only in the neighbourhood of the great centres but in the open country. The Annamites have rapidly adopted them for their personal consumption.

Native cotton is cultivated over extensive surfaces in the region of Nhe-Quan and the Huyên of Gia-Khanh, as likewise in the Huyên of Tam-Duong.

The cultivation of the mulberry is rapidly growing in the provinces of Thai-Binh and Kien-An, side by side with the silkworm industry. The castor-oil plant is the principal cultivation of the fifth month in the province of Phuc-Yên; it likewise covers a large number of lands in the province of Bacgiang. Rice growing with a view to the crop in the fifth month, is only important in the provinces of the Delta, where it occupies the moist lowlands and the soils easily irrigated owing to the proximity of streams.

In *Annam* rice is still the main culture, as it is indeed in the whole of Cochin China. Maize, which is beginning to find a market in the Far Eastern ports and even Europe, is spreading continuously n Annam. The very remunerative selling price of this commodity cannot fail to encourage growers to give every attention to its culture, as the produce may, in times of difficulty, form the basis for the food supply of the population, and furnish relief to those groups of the population who are fortunate enough to possess alluvial soils favorable to its growth.

The Cotton plant continues to be greatly cultivated in the province of Thanh-Hoa, in particular, but it is to be feared that this crop will give a poor yield.

In the province of Quang-Tri tobacco growing, which is the mportant resource of the population, is more and more practised. The growing of earth-nuts has been the subject of a very interesting endeavour. In a few years the production might assume very considerable proportions by the development of unworked lands.

For developing silkworm culture the Resident of Hatinh has specially insisted on the following two points: That the distribution of eggs should be quite free of charge and that applications for them should be entirely free, and no pressure whatever is to be exerted by the local authorities in order to get breeders to enter their names. The Resident of Aha-Trang also is, in conjunction with the provincial authorities, promoting the development of the silk industry in the province.

In the province of Quan-Nam the rearing of silkworms is steadly growing and in the course of the last three months 9 000 batches of eggs were distributed to the breeders.

In Annam, where grazing land is not wanting, livestock breeding nevertheless does not occupy the position it might hold in rural economy. It would be desirable for competitions to be organised and prizes awarded to the breeders producing the finest specimens of cattle and horses.

In *Cambodia* the yield of rice during the last quarter was very much below that of the preceding year.

The tobacco fields are thriving everywhere. The great spread of this cultivation in Kampot should also be noted.

Cotton also has bright prospects; the crop in the region of Kompong-Cham promises to be splendid.

KOLLER (Austro-Hungarian Consul at Yokohama). **Agriculture in Japan.** (Asien-Japan-Yokohama). *Berichte der k. u. k. Oesterr.-Ung. Konsulärämter.* Wien, November 1911. **9**

From 1901 to 1910 Japan has been almost stationary from the point of view both of the area under cultivation and the crops pro- **Japan** duced. In some cases the area has increased but production has declined; in others, the area has fallen off but production has increased.

The position of rice production is declining despite the growth of the population and notwithstanding the reduction of imports of foreign rice.

Barley rye and wheat are grown on a smaller area but on the other hand the production has increased remarkably. Haricots are continually gaining in importance ; the same is true of potatoes and sweet potatoes. Tea culture is expanding largely, especially variety No. 3 of green tea. While the importance of vegetable wax is falling off, that of the gum crop is increasing. Neither the area nor the production of tobacco show any increase.

Live stock breeding on a large scale, as practised in Europe and America, is unknown in Japan.

The Japanese horse belongs to the Mongol strain ; it is small and perspires quickly, but has much endurance. It is used more for transport than for riding. It is hardly ever used in harness except for the plough, oxen being harnessed to carts. Japan has about 1 552 000 horses.

Oxen formerly were only employed for work ; neither their flesh nor the milk of cows was consumed, though the latter is now used as in Europe. The breed of cattle is fine, large and easily fattened. It resembles the Hungarian Steppe strain.

Formerly sheep and goats were entirely wanting. To-day there are about 87 338 goats and 3 411 sheep. Pigs are raised near large towns and there are about 28 700 of them. On the other hand, the Japanese have always been passionate poultry breeders.

Notwithstanding the excellent conditions of climate and soil, the forests are not kept according to the most modern principles. The greater part of them are a long way from inhabited centres, and means of communication are wanting. In consequence of the great demand for timber for industry, trade and railways, the Government thought fit to intervene with a view to stimulating and facilitating the working of forests and it has at the same time made the systems of protection and preservation more stringent. The population are assisted by grants in planting new forests and in improving the old ones. The Japanese forests have an area of 22 121 112 Cho, (54 196 724 actes); half of which belongs to the State. (Cho=2.45 acres).

Fishing until latterly was confined to the coasts ; to-day it is spreading towards the high sea. It is undergoing rapid increase thanks to the measures taken by the Government, and in 1911 it yielded a return of about 78 000 000 yen (about £ 7 800 000)

Fishing at present employs 419 175 boats of the old Japanese type 396 modern sailing boats and 32 steamers. The chief items of fishery are herrings, cod, sea trout, whales, dolphins and oysters. Fish oil is exported to China and Europe.

HANN. (Austro-Hungarian Consul in Montreal). **Agriculture in the Provinces of Manitoba, Saskatchewan and Alberta.** (Amerika, Kanada, Montreal). *Berichte der k. u. k. Oesterr-Ung. Konsularamter.* Wien, Oktober, 1911.

The prairie provinces of the North-west of Canada, Manitoba, Saskatchewan and Alberta, in 1910 exported 13 537 382 quintals of wheat (26 641 568 cwt.), 439 760 quintals of oats (865 448 cwt.), 445 225 quintals of barley (876 203 cwt.), and 2 969 043 hectolitres of flour (8 167 837 bush.).

Dairy produce shows no increase; on the contrary butter has declined, so much so that the value of exports has dropped below 7 000 000 dollars. The reduction in egg exportation is due to increased home consumption. Cheese still plays a great part in dairy produce exports, its value having risen to 20 000 000 dollars. The condensed milk industry is in continual expansion, as is proved by the new factories built and the improvement of the old ones. The exportation of live stock for slaughtering undergoes continual fluctuations about an average of 7 500 000 dollars. The growth of fruit cultivation still continues, althougth the results hoped for a few years ago have not been obtained, chiefly in consequence of irrational cultivation and bad packing. The great future sources of fruit supply in Canada are the valley of Okanagan and the territory of lake Kootenay.

In consequence of the energetic measures taken by the Government, Canadian forests are less exposed to fires nowadays, thanks to the fuller precautions adopted by railways, hunters and the Indians. The extent of forest reserves belonging to the Dominion Government is as follows:

	Acres
Manitoba	2 288 160
Saskatchewan	473 000
Alberta	6 209 280
British Columbia	1 470 000

The Government have already created experimental agricultural stations at Brandon in Manitoba, Indian Head and Rostern in

Saskatchewan, Lethbridge and Lacombe in Alberta, and at Agassiz in Columbia. These establishments distribute seeds and plants free to growers.

POTUCEK. **Agriculture in the State of Parana.** (1) (Amerika-Brasilien Curityba). *Berichte der k. u. k. Oesterr-Ung. Konsularämter.* Jahrgang 1911, Seite 1-20. Wien, Oktober 1911.

In the State of Parana the agricultural population forms three-fourths of the total. This notwithstanding, agriculture is not in a very advanced stage. The implement in most general use is the hoe, and the plough is rarely found. Farm yard manures are but little used and there is a complete ignorance of scientific and rational methods.

An endeavour has been made to improve these conditions by creating a Committee of Inspection, having for its object to advise farmers and provide them with grants for the purchase of more modern agricultural implements and the introduction of machines, also for supplying them with seed and furnishing them with means for combating plant diseases and pests generally. It is intended at a very early date to inaugurate experimental fields under the direction of experts who will undertake to teach the rational cultivation of the plants suited to local conditions.

The main cultures of Parana are maize, rye, black haricots, potatoes, oats, barley, tapioca, flax, rice and tobacco.

Attempts have been made and are being made to acclimatise wheat, but up to now they have always failed. The reason is that rust attacks wheat very seriously in this country and a variety capable of withstanding these attacks has still to be found.

The results obtained in the production of hay and artificial fodder on the contrary were remarkable.

Fruit growing is neglected. Orange groves are fairly common. The vine is cultivated by Italian colonists, and banana trees are plentiful on the coast; the bananas are exported to Argentina. The interior, however, the climate and soil of which is splendidly adapted for fruit growing, is marked by a complete absence of fruit gardens.

The breeding of live stock is very poorly developed. The Federal Government has arranged a system of bounties for each thoroughbred animal imported from Europe, North America and Argentina

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(1) See above, N°. 8.

For those from Europe it is: 600 milreis (£.67 10*s*) for a stallion; 300 milreis (£.33 15*s*) for a bull; 150 milreis (£.16 17*s* 6*d*) for a pig; 120 milreis (£.13 10*s*) for a goat, and 10 milreis (£.1 2*s* 6*d*) for a head of poultry.

Pig breeding is already pretty largely developed and the production of ham, bacon and salt pork is considerable. Poultry breeding is chiefly practised in the neighbourhood of the great centres of production.

The production of milk and butter is only carried on by small farms. There is furthermore to be noted a complete want of organisation and association in all these branches of farm work Beekeeping is in continuous growth.

The difficulty of communication and the high railway rates form a serious obstacle to the development of agriculture and the growth of exports.

The forest wealth is considerable but it is worked without any rational method. The Brazilian Pine (Pinho de Parana, *Araucaria braziliensis*) and the Imbuĩa supply excellent bulding timber. The Maté (*Ilex Paraguayensis*) is next in order. The Government has published orders forbidding the felling of Maté timber before the trees have attained their maximum growth, and the gathering of the leaves (Maté grass) before their full development, from the 1st May to the 30th September every three years. This order has not yet been enforced but no doubt it will be, in view of the interest the owners themselves have in the protection of their plants.

BERTONI and RETSCHEK (Austro-Hungarian Consuls in Sao Paulo and Rio de Janeiro). **Agricultural Development in Sao Paulo and Rio de Janeiro.** (Amerika-Brasilien-San Paulo, S. 1-56; Amerika-Brasilien - Rio de Janeiro, S. 1-63). *Berichte der k. u. k. Oesterr.-Ung. Konsularàmter.* Jahrgang 1911 — Wien, November, 1911.

Despite the efforts made in the State of Sao Paulo to substitute other cultivations gradually for the prevailing coffee-growing, the latter still remains the most important item of production of this State, which produces nearly 6 300 000 bags.

Though the law prohibits new coffee plantations, these plantations continue to be laid down in the interior, the rise in price ensuring a nett profit of about 30 francs per bag to the grower, who need not fear the effects of over production until after 8 years, the time required for the growth of coffee plants.

zone contiguous to the Chaco is more adapted to cattle breeding, and lucerne yields magnificent crops, the value of which is far in excess of that of any other cultivation. In the south, on the contrary, the cultivation of cereals holds the upper hand ; ownership is more subdivided than in the north, in the neighbourhood of the Chaco.

It is not true that the growth of livestock breeding is always in opposition to that of agriculture, in Argentina, for in the province of Santa Fé these two departments often progress hand in hand.

Of late years the price of land has gone up 50 %.

The enormous development of the province is shown by the following figures :

1888	cultivated land	598 658 hectares	(1 478 468 acres)
1895	,,	1 684 937 ,,	(4 261 794 acres)
1910	,,	3 862 126 ,,	(9 539 451 acres)

In 1910 the production was as follows :

	Wheat	Flax	Oats
Acres of land . . .	3 044 974	1 584 127	9 789
Tons	866 582	391 896	3 235
Cwts per acre . . .	5.686	4.94	6.61

The province contains one water and 39 steam mills and 5 oil factories. The latter in 1910 turned out 220 tons of linseed oil, 1821 of earthnut oil and 43 of colza oil.

Vine-growing only yields 200 000 kilogrammes (196.8 tons) of grapes.

Side by side with the improvement in the cattle, the dairy industry is undergoing greater expansion, above all at Esperanza. In the Province there are 73 cream-making establishments, 6 butter factories, 6 cheese factories and 15 mixed establishments. For the manufacture of cream there were used 25 000 000 litres of milk, for cheese 4 569 000. There were produced 1 617 517 kilogrammes of cream, 793 000 of butter and 433 000 of cheese. The dairy industry is chiefly carried on by German and Swiss colonists.

14 **The Future of Agriculture in Northern Chile.** (1) (Porvenir de la Agricultura de la zona Norte de Chile). — *Anales de la Sociedad Agronomica de Chile*, No. 8-9, pp. 241-250. Santiago, Ag. i Setiembre de 1911.

Chile The Northern agricultural region of Chile comprises the provinces of Atacama and Coquimbo; the province of Tama being of no agricultural importance save through the small exports of vegetables and fruits from Tarapaca.

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(1) See *Bull.* February 1911. No. 374 (*Ed.*).

The province of Atacama has an irrigated surface capable of cultivation of 20 366 ha. (50 235 ac.), and a non-irrigated area of 31 831 ha, (78 656 ac.); the province of Coquimbo comprises 73 927 ha. (182 716 ac.) irrigated and 63 206 ha. (156 184 ac.) not irrigated. The Northern agricultural zone is formed by more or less narrow valleys lying between plateaus. Their geographical configuration facilitates the utilisation of water for irrigation. On the plateaus, lakes and fords for watering cattle are frequent.

The "Sociedad Agricola del Norte" has erected a large number of installations for conveying to the plateaus the water intended to supply hydraulic energy for industry and agriculture. The soils, which are of a marly and loamy character, are of good chemical composition. Rain is rather rare; the Northern zone of Chili is indeed exclusively irrigated by streams fed by the melting of the Andes snow.

The coast region is adapted for growing fodder; the interior region on the contrary presents excellent conditions for growing fruit trees. In the former, lucerne is cultivated on about 55 000 ha. (136 000 ac.), and as intermediate cultures, wheat, maize and barley. More frequent renewal of the lucerne fields would considerably increase the output of cereals.

The potato is also of great importance in this zone, above all for local consumption. They are planted so as to have a supply of fresh potatoes at almost all times of the year. Market gardening is also carried on. Olives do well and yield excellent fruit for pickling. This branch of cultivation is continually extending and promises to become a first-class source of revenue.

Extensive culture is practised everywhere except in the environs of towns.

Cattle are divided as follows:

	Province of Atacama	Province of Coquimbo
Oxen	11 108	66 575
Horses	4 954	20 405
Sheep	14 520	98 381
Asses	6 173	11 399
Goats	3 974	68 450
Mules	2 688	5 945

The province of Coquimbo is therefore much richer in cattle than that of Atacama. The cows in this latter province only produce milk for local consumption.

The province of Coquimbo in addition produced a little over 1900 qls. (190 tons) of wool.

The flora of the region would allow of bee-keeping on a much larger scale than at present.

In the zone of fruit trees the climate is temperate. The main item of cultivation is the vine, of which the Alexandria Muscadine or Italian Grape is chiefly cultivated. The principal products prepared from the vine are raisins. Peach growing (with clingstone fruits) is next in order of importance to that of the vine; the demand for this fruit is very great and increases continuously. Fig trees thrive splendidly in the country and citrus trees could also be very well cultivated. In this zone lucerne and cereals are likewise grown, but to a much smaller extent. In the valley of Copiapo, onion-growing is becoming more and more widespread. In the whole of this zone the land ownership is very much broken up and the cultivation is intensive to a degree.

New railway lines and hydraulic works on a large scale might raise the agricultural development of the region to its maximum.

The provinces of the North furnish cattle and agricultural products to the nitrate zone; milk, meat, fruits, vegetables, cereals and all the Northern products are exported to the industrial and mining provinces, and the day is not far distant when the Northern provinces in Chile will play the part which has fallen to California in the United States.

The dried fruit industry, which has just been entered upon, is destined to find a very extensive field of work.

Wine manufacture in Chile is excellent; good types of Port, Malaga, Madeira and Marsala are prepared.

In 1910 the agricultural zone of the North exported the following produce:

Cowhides	291.8	tons
Goat-skins	60.0	»
Ass-skins	0.5	»
Chinchilla	52 363	skins
Wool	123.0	tons
Honey	43.5	»
Wax	14.5	»
Algarrobilla	1 576.0	»
Barley	29.1	»
Raisins	65.4	»
Figs	9.6	»
Nuts	123.3	»

Chinchilla hunting has assumed excessive proportions and threatens entirely to destroy the animal yielding this rich fur. To meet the enormous demand for Chinchilla skins, the " Raton gora " is hunted, supplying an imitation chinchilla, called " vizcachilla " or " bastard chinchilla ".

Agricultural Resources of Kordofan and Darfour. (Les ressources agricoles du Kordofan et du Darfour). *Revue Générale Agronomique*. No. 9 pp. 350-354. Bruxelles, Septembre 1911.

The western region of the Anglo-Egyptian Sudan comprises the provinces of Kordofan and Darfour.

Northern Kordofan presents the appearance of a vast plain traversed in the north by low granitic hills ; towards the south the region is more undulating and more wooded; here are found the gum forests constituting the principal wealth of the country. El Obeid, the capital, is surrounded by a rather bare, not very sandy plain ; 30 miles west of this city begins the Dar Hamar, the region of waste steppes without rivers or watercourses, extending to the frontiers of Darfour ; it is traveresd by large dry valleys. At Kordofan the water supply depends entirely on the local rainfall ; therefore, the water is obtained either from wells or from ponds. When these resources fail, the inhabitants must content themselves with stored water, kept by them in the Baobabs. These tree reservoirs are arranged as follows; the largest branches are lopped off flush with the trunk ; an opening is next cut in the latter and the interior hollowed out ; the tree is surrounded with a shallow basin 20 to 30 ft. in diameter, into which the rain water falls. After each shower the inhabitants come out and fill the trees ; the water thus kept remains perfectly good till the end of the hot season.

South Kordofan, a very different region, is formed by a plain of black earth drained by several watercourses.

The province of Kordofan possesses extensive vegetation resources which will be better turned to account when the intended railway is an accomplished fact. Up to the present, transport is always effected by camels in the north, oxen and asses in the south. Gum constitutes the principal source of revenue of Kordofan. Only those forests which lie not far from El Obeid and between El Obeid and the Nile are worked, but it is beyond doubt that when the railway is constructed the vast forests of Dar Hamar will also be worked. In the Sudan there are two principal varieties of gum, the *Hasbab* or Kordofan, gum, obtained from *Acacia Senegal* and forming the great bulk of the exports, and the *Tahl* gum, secured from *Acacia Seyal*. Endeavours are being made by the Government to extend the surface of production and increase the yield. The gum harvested is conveyed to Omdurman and Khartoum, where it is purified and cleaned for export. The gum trade is the most important in the Sudan, the average yearly exports being estimated at 150 000*l.* Egyptian. The gum of the Sudan is what is known in Europe as Gum Arabic. Side by side with the acacias other less important gum trees are found in the Sudan such as the *Tautar* (*Sterculia cinerea*), *Sterculia tomentosa*) *Cordyla africana*, *Acacia arabica*, *Acacia Suma* and *Odina fruticosa*.

The principal cereals cultivated in Kordofan are " Dukhu " (*Pennisetum typhoideum*) in the northern region and dura in the south " Dukhu " (millet) grows on the sandy hills and requires little water ; dura demands more moisture. Tobacco is cultivated to a rather limited extent ; the region also produces cotton, though in small quantities.

The Baggara tribes possess large flocks of cattle of the humped breed, the animals are small but their meat is good. A smaller breed ; without hump, is found in the south. The Dongalawi horse is esteemed but is rare. Ostrich feathers formerly constituted a considerable branch of export from Kordofan.

The forests of Kordofan, with the exception of those containing gum trees, are of little value ; good species are absent and even in the south, where there are many big trees, the wood is either very hard like that of the tree called " Sunt " (an acacia) or too soft, like that of the Baobab.

16 VISCHER. **Geography and Economic Conditions of Tripoli.** (1) *The Geographical Journal*, No. 5, pp. 487-491. London, Nov., 1911.

Tripoli

Tripoli is not a geographical unit, but consists of several regions which differ in many important respects the one from the other. These different countries are · Tripoli proper, the Tableland of Cyrenaïca, and Fezzan, a collection of oases separated from the coast region by the stony desert. At Tripoli from the coast inwards, to a distance of 40 to 80 miles, runs a plain, called Jefara, which has all the characters of a steppe. Only a small strip of land along the coast combines a sufficient rainfall with sufficient fertility to enable it to support vegetation. This cultivated strip is about 3 miles wide and is called the Meschia. The rest of the plain is covered by dunes ; between the dunes are camel pastures, and very few patches of cultivated land. The plain is untersected by *Wadis*, or river-courses; the direction of these wadis is from south to north. Some of the mountain regions—which are at distances of 40 to 80 miles from the coast—are well cultivated with fig and olive trees, vines and corn.

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(1) Cf. *Bull.* Nov.-Dec. 1911, **Abstr.** 3096. (*Ed.*).

The esparto grass is brought to Tripoli from the mountains.

At the southern border of the Hamada begins the land of Fezzan, a collection of oases. Fezzan is intersected by *wadis*, which have a course from west to east. The land does not possess pasture grounds large enough for its needs, and this compels the inhabitants to drive their cattle to pasture in the steppes of the great Syrtis. The fruits of the date palms they sell to the Bedouins, who come at the end of the summer, bringing in exchange corn and barley. The resources of the land are not large enough to support its inhabitants. A section north and south across Cyrene shows that the country consists of three main levels; on the north is a low, narrow coastal plain, which ends in land at the foot of a steep cliff. The cliff is the front of a platform, the surface of which rises from 1000 feet above sea-level at its northern edge to 1300 feet further inland. The products of the soil are barley, wheat and maize; but cattle rearing is more important. The cattle are exported oversea to Crete and Malta, but mostly overland to Egypt. The climatic conditions of Cyrenaïca are Mediterranean in character, but show great variations, and for this reason the yield of the crops is very irregular. There is little doubt, however, that Cyrenaïca forms the most valuable portion of the vilayet, and that which offers most advantages for permanent settlement.

The prospects of Tripoli in the future depend solely on agriculture. No doubt something could be done by an enlightened administration to increase the fertility of the soil. But much capital would be required for construction of artesian wells and irrigation works

Some scientists hold that the present miserable conditions of the country are due to climatic changes; further, it is obvious to the most casual observer, that the migrating dunes which have been allowed to invade the Jefara are a serious hindrance to any agricultural undertaking.

Tripoli is known only in its broader features, and we may still class some parts of Fezzan and of Cyrenaïca amongst the unknown lands of Africa.

17 GUNBISSICH (Austro-Hungarian Consul at Tunis). **Agriculture in Tunis.** (*Afrika-Tunis*). *Berichte der k. u. k. Oesterr-Ung. Konsularämter.* Jahrgang 1911 - Wien, November 1911.

Tunis

In Tunis there are one million hectares (2 470 000 acres) under cereals and 4 million hectares (9 880 000 acres) are still to be brought under cultivation. Wheat and barley occupy nine-tenths of the cereal area; oats, maize and sorgho share the rest. At Beja, Bizerta and in the Medjerdah valley wheat predominates; at Tunis and Grombalia wheat and barley are equal in quantity; at Kairwan and Susa barley leads. The wheat cultivated is hard-grained. In 1910 there were exported 89 242 quintals (175 807 cwt.) of wheat and 1 000 000 quintals (1 968 000 cwt.) of barley. With a view to extending the cultivation of oats, the Regency decreed tax exemption for oat fields, which hitherto have not produced more than 550 000 quintals (1 083 500 cwt.) Excellent results were obtained by sowing broom sorgho imported from Venetia and Piedmont. In the north flax-growing is spreading considerably.

The cultivation of the vine and fruit-growing make great progress. In 1910 Tunisia produced about 250 000 hectolitres (5 500 000 gals.) of wine. The French Government allowed the importation into France of 200 000 hectolitres (4 400 000 gals.) of wine with a duty of 60 centimes per hectolitre (about ¼ *d* per gal.) for a wine containing up to 11° of alcohol. Citrus fruits are not so important as date palms which number 1 500 000; every year they give a crop of about 20 000 000 kilogrammes (about 20 000 tons); the annual exports of dates average 4 000 000 kilogrammes (about 4000 tons) in which the fine variety « Deglaat-en-nour » predominates. There are also exported 1 500 000 kilogrammes (about 1500 tons) of almonds.

A large item is the production and exportation of alfa (esparto grass), whichis used for making highclass paper. Although Tunisia is rich in tree species, the exportation of timber is almost nonexistent. Tunis is to-day the country producing the largest quantity of oil in the world; this oil is constantly improved in consequence of perfected processes of manufacture. More than 220 000 hectares (543 400 acres) are planted with olive trees, of which there are 12 000 000. The annual production fluctuates between 300 000 and 400 000 hectolitres. (6 600 000 and 8 800 000 gals).

Tunis possesses 31 500 horses, 17 500 mules, 85 000 asses, 166 000 oxen, 1 000 000 sheep, 600 000 goats, 16 000 pigs and 118 000 camels.

The horses are excellent, of the Berber and Arab-Berber strain. The Regency has introduced the breeding of thoroughbred Arab horses. The cattle suffice for the needs of the country and are only exported to Europe by way of exception, if the grazing is very good in the spring.

The exportation of pigs, sheep and goats undergoes continual fluctuations, owing to the character of the season, which exercises great influence on the death rate.

The forests extend over a line 5000 kilometres (3100 miles) in length; they are divided into two zones which are separated by the valley of the Medjerdah. In the north cork trees, wild olives; elms and Thuyas predominate; in the south, firs. The cork tree occupies about 90 000 hectares (222 300 acres). In some years up to 145 000 quintals (285 360 cwt.) of cork have been gathered for exportation. In the oak forests, tan is also produced.

Fishing is a great source of wealth to the country, as the coasts abound in tunny, sardines, dories, and sponges. In 1910 the fish yield was 40 000 tons and sponges 1 760 tons.

The largest proportion of farmer settlers and fishermen is provided by the Italians.

BADOLO (Italian Consul at Boma). **Agriculture in Senegal.** (L'Agricoltura nel Senegal). *Rivista d'Africa*, No. 5 pp 566-585. Roma, 1 Nov. 1911. **1**

Sen

The natural products of Senegal are rubber and gums. The regions of Casamance produce 50 % of the rubber; the rest comes from regions adjacent to Upper Senegal. The gums almost all come from regions adjoining Mauritania and very little from the region of Thies.

The most important product of cultivation, forming the chief wealth of Senegal is the earth-nut, found everywhere. Next follow various cereals, rice, maize, millet and sorghum; as yet however they do not even suffice for local consumption.

In the interior of Senegal there are two breeds of oxen, the humped ox (Zebu) and the ox without a hump. There are also different breeds of goats, camels, asses and horses, the last-named being small but very strong and known throughout West Africa.

Cattle breeding nevertheless is neglected by the natives generally. In Dakar and St. Louis only tinned milk and butter are used. The exportation of oxen is practically limited to the quantity required to supply ships; horses constitute the greater part of the live animals exported. Hide exports are insignificant.

The total exports of Senegal in 1910 amounted to 63 861 988 francs, while in 1905 they did not exceed 24 000 000. Earth-nuts represent 78 % of the total exports.

Rubber is declining: in 1910 there were exported only 319 tons. The best is obtained from *Landolphia Heudelotii* and the second quality from *L. fiorita.*

Agricultural Products exported in 1910 (in francs).

Earth Nuts	36 158 457.
Rubber.	3 879 708.
Gum	1 330 581.

10 **Palm Kernel and Fibre and Kola Nut. Production and Exports of Sierra Leone.** (Rep. of the Colonial Office). — *The Board of Trade Journal*, No. 781, pp. 344-345. London, Nov. 16, 1911.

Sierra Leone

A very large proportion of the palm kernels grown in Sierra Leone are wasted because they are not sufficiently near to the railway or port of shipment to make the gathering profitable. The industry could be greatly extended but for the scarcity of labour. At present all the produce has to be carried to the railway or rivers on the heads of natives; so that with every new area opened up by road or railway, an additional output of palm produce can be confidently expected.

The output of palm produce has increased considerably since the opening of the branch line to koruks, and, as the line which is at present under construction will penetrate into the heart of the produce country, a further increase in the output will inevitably follow.

A product of the palm tree which is not generally known is the fibre. This fibre is of very good quality and realises as much as £.60 a ton in the Liverpool market It is the only fibre that is sufficiently fine and strong for making fishing lines, and this is the only use to which it has been put by the natives. The process of extraction by hand labour is laborious and unremunerative.

There is an enormous supply of that material in the country which at present rots on the ground, but which might be turned to profitable account.

The export of Kola nuts incrsased in 1910 in quantity by 189 tons, and in value by £ 38 023, as compared with 1909; and the demand appears to be steadily increasing, owing to the rapid development of the West Coast of Africa by railways and roads.

The industry, during 1910, appears to have spread in some measure beyond the control of the traders of the Colony, and the Protectorate, because for a few months in that year Portuguese and natives from the neighbouring West African Colonies came to Sierra Leone and purchased large quantities of Kola nuts at prices favourable to local sellers. There are two classes of exporters engaged in the Kola nut industry; the one consisting of well established European houses, and the other of native itinerant traders.

There is no doubt that the systematic cultivation of the Kola nut would prove a remunerative investment. No preparation of the product is required; it is ready for sale and consumption as soon as the fruit is picked.

BÜCHER. **Agriculture in the District of Dschang, Kamerun.** (Eine Dienstreise nach Dschang. Die Oelpalmenbestände im Dschang-Bezirk). — *Deutsches Kolonialblatt*, Nr. 21, S. 809-815; Nr. 22, S. 844-846. Berlin, November 1911. 20

The agriculture carried on by the natives along the northern railway in Kamerun is that of native nomad tribes, except that it is more intensive and varied. After clearing the ground of weeds and shrubs, the natives form heaps of earth a yard wide and half as high in the fields, on which they plant.

Kameru

1) Maize, "Macabo", sweet potatoes.
2) Maize and plantains.
3) Sweet potatoes and plantains.
4) Maize and haricots.

To till the fields a sort of hoe is used, which with a knife for cutting away bushes and a basket, forms the entire agricultural equipment of the country.

The palm tree is worked, and the cultivation of maize extends continually. As the natives however neither use cattle for agricultural work nor natural manure, maize culture is only possible after the manner of nomad peoples.

About Bare, at 850 metres altitude, the area of the farms ranges from 15 to 20 acres each; they are chiefly cultivated with maize and "macabo". Sweet potatoes are specially used for food by carriers. Breeding sheep etc. is practised, but on a very small scale. One farmer also imported horses and 46 head of cattle.

In the plain of Mbo, surrounded by marshes, rice growing would perhaps be possible. After Mbo, traversing the summit of the mountains, the grass land zone is reached. Here the farms are frequent and well cultivated, especially with macabo and sweet potatoes.

Each house has a garden planted with kola and figs. Banana, maize and tobacco plants abound. European potatoes, the growing of which has been tried, were very successful. Live stock breeding gives excellent results; the animals are fed for a very short time under shelter and spend the rest of the year grazing.

The Government should undertake to import 1,000 to 1,200 head of cattle, with a view to still further encouraging and spreading the breeding of cattle among the native. It should not be forgotten that cattle breeding and plough cultivation are dependent on the creation of a school of agriculture. The introduction of the plough would involve priceless advantages to the country. The cultivation of maize could then lead to extensive exportation.

The Kola nut (*Cola vera*), the cultivation of which is already largely practised, also deserves fuller attention.

The oil palm is beginning to be frequent in the district of Dschang, near Lum; likewise in extensive areas at Lala, Ndunge, Manengoten, Manebambe and through the district of Bakaka; they are not very productive, but reach a height of nearly 50 feet. On the other hand the plain of Mbo has few oil palms. It should be noted that these trees yield good products, even at a height of 1 100 metres (3 700 ft). Therefore the German Colonial Government is actively engaged in developing this production. The oil palm requires very little care; it suffices to keep the soil in its shade free from weeds and brushwood and above all not to neglect manuring.

In order to encourage production, the Government should improve means of communication, adopt technical and administrative measures to interest the natives, increase the use of manure, create new plantations and safeguard those at present existing.

Above all, it is necessary to found an experimental station and a school of agriculture for the natives.

21 DRUMMOND-HAY. **Agriculture in Angola.** *Diplomatic and Consular Reports* (Portugal-Angola). No 4772, pp. 13. London, 1911.

Angola

The failure of the cotton crop of the German Syndicate in Angola in 1910 was due partly to natural causes, and partly to the inexperience of the farmers, and the absence in the fertile belt of cattle capable of withstanding the attacks of the Tsetse fly.

Greater success might attend the growers' efforts if they would employ agricultural machinery, such as light motor ploughs, which however, their small resources at present prevent them from buying. It is a thankless task for the native or European to attempt to grow cotton in Angola on soil prepared with the hoe. The quality of the cotton grown was excellent on the whole, and realised very good prices.

The principal rubber-yielding tree in cultivation in Angola is *Manihot glaziovii* (Ceara rubber). Some 2000 acres are at present planted in the district of Loanda alone.

Up to now Europeans only have paid attention to this industry, but the natives, seeing the good results, are beginning to take an interest in this cultivation. The native owners of coffee land in Golungo Alto are enthusiastically planting *Ceara Manicoba* in their properties. The export of the Manicoba rubber during 1910 reached at least 5 tons.

Next in importance to *Manicoba* comes *Ficus Elastica.* The chief point in favour of this species is that the trees will endure rough treatment at the hands of the native labourers without suffering any serious consequences. The *Manicoba,* on the other hand, is much more delicate. The *Manicoba* in this country is a short-lived tree, and will not endure rough tapping operations.

Of other rubber trees introduced during recent years no extensive plantations have been made. For the small planter the *Para Rubber* seed imported from Ceylon proved too expensive, as the percentage of trees which grew was very small indeed. Those trees planted, however, at elevations varying from 1000 to 3000 feet grow well. Tapping of the Para rubber trees has not yet commenced, but it is doubtful whether this species will compare favourably with the *Manicoba* and *Ficus Elastica.* Further experiments with *Castilloa* and *Funtumia* are in progress on the Government's experimental farms, but on private estates no attention at all is paid to these rubber-producing trees.

In the district of Benguella, the central region from which root rubber is exported, no rubber plants at all are cultivated to-day.

Experiments have shown that South American rubber trees, as well as the Assam Tree *Ficus Elastica,* do not thrive, the climate being too cold. The experimental plots in the same region of various species of *Manicobas* are necessarily small, but the stunted growth and slow development of the plants indicate that the region of Benguella is not sufficiently tropical for growing rubber.

Experiments made by Europeans in the regions of Bihé, Bailunda and Ganguellas to cultivate the tuberculous rubber plant known as *Betinga* (*Raphionacme utilis*) have proved a total failure. To raise the plants in the seed beds was easy enough, but the development of the *Tuba* containing the rubber was too slow.

Angola exports only wild-grown coffee of the commonest Bahia sorts. With the exception of half-a-dozen properties in the district of Loanda, which are under European administration and grow some of the Arabian and Liberian kinds, all the coffee comes from groves owned by natives at a distance of some 200 miles from the coast.

One plantation of cacao in the Calunga district is said to prosper, but it seems that the climate of Angola is not tropical enough for this plant. The export of cocoa beans is insignificant, though the price obtained for them is the same as that for San Thomé cocoa.

Very little is being done as regards the planting of cocoanut and palm oil trees large groves of the latter are to be found practically abandoned on the banks of the Zuanza River.

Large herds of cattle are to be seen in the higher regions of Cambambe, and also at Duque de Braganza, Malange, and Pungo Andongo. Latterly merchants have been buying large numbers of bulls and cows and sending them to the interior of Lunda, where they are exchanged for rubber with the natives, who gladly pay good prices for them for breeding purposes.

22 Baldacci. **The Development of Agriculture in Southern Italian Somaliland.** — *United Empire*, Vol. II, No. 11, pp. 787-794. London, November 1911.

maliland

From the Ethiopian tablelands and mountains spring the two rivers, Juba and Uebi-Shebeli. These wind through lands of a marvellous fertility. A country irrigated by these two rivers, and with a fair climate, inhabited by populations who perhaps have remote affinities of blood with Mediterranean peoples, cannot but bring forth practical results.

The fertility of the soil in Benadir is surprising in the zone of the rivers. From Bardera to its mouth, the Juba is a little Nile. In its valley the most various native products may be raised, and, although the land is ploughed and tilled only with the rudest tools, the richness of its vegetation is incontestable. Even three crops a year can be raised. The Uebi-Shebeli forms one of the richest and most promising valleys. The region it runs through, like that of the Juba, is thickly populated, with plains easily irrigated and of a marvellous fertility.

Notwithstanding the extraordinary qualities of the soil of Benadir, the cultures are little varied, and consist mainly of dura, corn, sesame, beans, cotton, and a little tobacco.

A very small part of the territory is cultivated, and this not because the Somalis have no liking for agriculture, but because they always fear pillaging.

The cultivation carried out by the Somalis subject to Italy is generally good. In the region of the rivers the people show their great disposition to agriculture. The soil is divided in small squares to hold the pluvial waters, and the rainfall season is taken advantage of to irrigate the fields, by means of small ditches in every direction. The richness of Benadir consists mainly in the fertility of the soil, which must be developed with capital and initiative. The Somalis prefer cattle-raising; the slaves and freedmen attend to cultivation.

At first, in 1908-1909, the concessions of land for tropical cultivation were given without following a special line of ideas. The new Governor has proposed a scheme tending to fix the guarantees, in order to protect the State from the serious dangers of monopoly by speculators. The concessions could be of different kinds and sizes, from large areas for agricultural and industrial exploitation, backed by heavy capital, to small areas for associations of small proprietors.

The question of land exploitation is connected not only with land leasing, but also with irrigation, by which the country would immediately become valuable. When the fertile part of the country is irrigated, it will become more productive than any other East African Colony, and will be especially fit for plantations of rubber trees, cotton, corn, and sesame, while the non-irrigated zone would produce in abundance *Agave sisalana*.

One example — that of the Bricchi and Zoni concession — proves how the hydraulic question can solve every tropical culture problem. The region between the Juba and the Uebi-Shebeli has not to overcome natural difficulties involving great cost. The problem of colonising Southern Italian Somaliland is, from a political point of view, of the greatest importance to Italy, considering the possible value of the Colony and the opportunity of directing thither a part of Italian emigration.

Besides an immense cultural field, Benadir possesses also a spontaneous flora interesting for exploitations purposes. There are forests along the Juba, and woods that would be useful for constructions are not lacking. Of course something must be done in a negative sense in the lands occupied by bushes and shrubs; several of these spots will have to be cleared out, even if it cost the workers some sacrifices, because the idea of land tillage must always be considered as the first and most important Government action.

With commerce local industries may be hoped to flourish, as, for instance, fishing, the waters of Benadir being very rich in fish.

The seed oil industry may be developed, as well ast hat of earthen pots, largely sold all through Benadir and the neighbouring countries.

The stocks of cattle, goats, sheep, camels and donkeys, although primitive, can be easily bettered when properly selected and crossed. Cattle-raising finds very favourable local conditions, on account of the immense prairies of excellent grass, and the Somali people's peculiar activity in this kind of industry. In Somaliland cattle-raising represents the only business in which the native invests his money, even if he has already large herds.

The cattle industry is very remunerative on account of the very small cost of hay and native labour. There are some districts — and these not always the largest — with an immense number of cattle.

28 WARNACK **Agricultural Trade of the German Colonies in 1910.** (Der Handel der Schutzgebiete in Afrika im Jahre 1910). -- *Deutsche Kolonialzeitung*, No. 48, S 799-801. Berlin, Dez. 1911.

erman frica

The agricultural export trade of the German colonies in Africa was largely and continuously on the increase during 1908, 1909 and 1910, as will be seen from the following table, reckoned in millions of marks.

	1908	1909	1910
East Africa	10.86	13.12	20.78
Kamerun	12.08	15.40	19 92
Togo	4 92	5.80	5.81
South-west Africa	7 80	22.07	34.69

At the same time it must be noted that, in the case of South-West Africa, the value is also included of everything relating to diamond mining.

In East Africa export trade owes about half its value to India-rubber. The exportation of sisal hemp too, is in progress and is full of promise. Skins rank next in importance. Copra, earth-nut, and the timber of the Usambara forests continue to increase in value. But the exportation of cotton has been slow in developing; in 1910, 2492 bales were exported, against 2076 in 1909.

In 1910 Kamerun exported:

Rubber	1 962 tons
Palm-nuts	13 689 »
Cocoa	3 431 »
Palm oil	3 141 »
Ivory	38 »
Timber	1 633 »

It must be noted with regard to rubber, that only 28 ha. (69 ac.) were productive out of the 4049 ha. (10 000 ac.) which the Colonial Government has had planted.

The Togo export trade is not in a satisfactory condition, as may be judged by the following figures (in metric tons):

	1910	1909	1908
Palm-nuts	8216	8 013	5 122
Palm-oil	3079	2 780	1 359
Rubber.	135	147	147
Cotton	464	511	419
Maize, ...	4548	13 490	30 205
Cocoa	173	134	83
Ivory.	2	3	5

As we see, not only is there a total lack of the encouraging progress of the other colonies, but even a slight falling off, or at best a scarcely perceptible improvement. All this is mainly due to the unfavourable climatic conditions of the last two years.

The South-West African colony presents the following figures, as usual in millions of marks, regarding the agricultural export trade:

	1910	1909	1908
Skins	130	119	85 tons
Ostrich feathers .	247	358	658 kilogr.
Cattle	78	53	55 head
Sheep	260	685	95 »

The diminution in ostrich feathers is compensated for by the increase in skins.

WOLF. **The Agricultural Development of German South-West Africa.** (Zur wirtschaftlichen Erschliessung von Deutsch-Südwest-Afrika). — *Deutsche Kolonialzeitung*, Nr. 44, S. 733-734. Berlin, 4 Nov. 1911. **24**

German
South W
Africa

The suggestions made in Germany with a view to the economic development of the colony of South-West Africa take an industrial, commercial and agricultural form.

South-West Africa is the only colonisable German possession, in the sense at least that German colonists can live there without danger to their health.

The Southern zone, about 200 000 square kilometres in area, is specially adapted to colonisation by German immigrants, while the 600 000 square kilometres which form the remainder of the territory are on the contrary tropical and subtropical in climate.

In the colony there have always been large amounts of capital invested in trade and the mines, but agriculture has derived very little benefit.

Agriculture is carried on on medium estates without large capital; nevertheless the future of the colony, especially in the south, depends on agricultural development.

In the southern zone cattle-breeding is capable of very largely increasing the wealth of the colony. The revenues already secured in breeding the African sheep called the « Bocky » for its meat, have fallen off, now that on large estates oxen alone are reared for meat, and it is very difficult to find a big enough market for African mutton.

A better return is derived from breeding sheep for wool. Germany is dependent on foreign countries for 90 % of the total quantity of wool needed for its industries. The annual imports of wool reach a value of 450,000,000 francs (£ 18 000 000). From this figure it will be seen how desirable for Germany and its colony would be the rearing of the wool-bearing sheep, which can be enormously developed in South-West Africa.

German South-West Africa lies in the same latitude as Queensland, the Australian State best adapted for sheep-breeding, and its topographic and climatic conditions are similar. Acclimatisation experiments carried out in the colony with Australian merino sheep will only become profitable when the colony possesses at least 2,000,000 merino sheep, the minimum quantity by means of which the international wool market can be influenced.

The world's wool market is regulated by the ever-growing demand and the cost of production. The cost of production depends on the interest on the starting capital, the interest and redemption of the value represented by the animals, the wages, costs of transport, and commercial expenses.

A comparison between Australia and South-West Africa supplies the following data:

One hectare of land for sheep-breeding in Australia costs from 250 to 625 francs (£ 4 to £ 10 for 1 acre), while in the German colony 1875 to 3125 frs. (£ 30 to £ 50 for 1 acre) are paid. A sheep in Australia costs from 18.75 to 37.50 frs. (15s. to 30s. while its price is from 50 to 56.25 frs. (£ 2 to £ 2 5s.) in South-West Africa.

Labour is cheaper in the colony than in Australia, the costs of transport are less by one half, and the commercial expenses are also lower.

It follows from these particulars that the breeding of wool-bearing sheep in South-West Africa may yield a most excellent general return when undertaken on an extensive scale.

Agricultural Export Trade of the Seychelles. — *Bulletin of the Imperial Institute,* Vol. IX, No. 3, pp. 280-283. London 1911.

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The fall in price of the vanilla, due in part to over production and in part to its replacement by artificial vanillin, directed attention in Seychelles to the necessity of finding new products for cultivation in the Islands.

Seyche

That this process of establishing the trade of the Seychelles on the more secure basis of a variety of industries is still being extended, is shown by a report on the export trade of the colony in 1910.

The total exports from the Seychelles in 1910 reached a value of Rs. 2 242 730 (£. 149 515 6*s* 8*d*). The vanilla exports decreased in value by three quarters of a million rupees from 1907 to 1910.

The most important article of export is coprah of which 2657 tons were shipped.

Cocoanut oil shows a decrease, only 346 hectolitres having been exported.

The most important work to be done for the colony in the near future is the extension of the area under the cocoanut palm, and the improvement of the methods of cultivating this tree.

The export of guano continues to rise steadily, 23 093 tons having been exported in 1910. Vanilla now occupies the third place, the quantity shipped in 1910 being 26 tons. It would not now make a vital difference to the colony if the vanilla industry were entirely eliminated.

The quantity of mangrove bark exported was 531 tons. The development of this trade must for the present be capricious, as the forests are in the hands of a single lessee, and there is a special difficulty in organising labour parties to collect the bark owing to tidal action in the lagoons. The trade in essential oils is still capable of expansion. The export of calipee has now acquired some importance.

In Seychelles there is room for considerable development in the export of fruit, either fresh or dried, and it is of interest in this connection to note that dried bananas appear in the list of exports (1).

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(1) Chief products: cocoanuts and vanilla: about 150 000 plants of Para rubber are growing; on some islands mangrove bark is collected and phosphate deposits are worked. Exports, 1909, £ 105 621. The chief exports are vanilla, cocoanut oil, soap, guano, salt fish, tortoise-shell, coffee, drugs and cacao. Cocoanuts and cocoanut products exported 1909, £ 45 576; vanilla, £ 13 356. (*The Statesman's Yearbook 1911*, p. 188. London, 1911). (*Ed.*).

EDUCATION IN AGRICULTURE AND FORESTRY. AGRICULTURAL EXPERIMENTATION.

28 A. v. LIEBENBERG. **The Objects of the Experimental Farm of the I. and R. Higher School of Agriculture of Vienna established at Grossenzersdorf.** (Uber die Aufgaben der Versuchswirtschaft der K. K. Hochschule für Bodenkultur in Grossenzersdorf. Inaugurationsrede, gehalten am 24. Oktober bei der feierlichen Inauguration des antretenden Rektors der K. K. Hochschule für Bodenkultur in Wien). — *Wiener Landwirtschaftliche Zeitung*, 61. J., Nr. 88, pp. 983-985. Wien, 4. November 1911.

Austria

The experimental farm of the Vienna Higher Agricultural School, founded in 1903, extends over 50 hectares (125 acres), which suffices to make it an independent undertaking.

The fundamental purpose of the organisation was to provide an experimental farm equipped with all the means of production, the object of which nevertheless is not to ensure a revenue, but to serve for the carrying out of experiments. The idea of establishing a complete farm is a noteworthy stride, and distinguishes this farm from the experimental fields with which the majority of schools are endowed; indeed for these experimental fields recourse must be had to foreign agents for traction power, manure and the disposal of the produce. Furthermore, the farm in question is clearly distinguished from the old type of model farms, which had as their prime object to secure revenue, and were only secondarily concerned with scientific investigations. Finally, this farm differs from other farms depending on experimental stations, in that not only is it to serve for the experiments of the professors but also for demonstrations to the students. It will likewise form the fundamental basis for instruction in all agricultural sciences by practical work carried out in other establishments, laboratories, hot-houses, etc.

As a matter of fact all progress in agriculture is closely bound up with experiments on the soil. Thus, for instance, vegetation experiments in pots may very well serve for the study of certain questions, descriptions of manure to be adopted etc., but will not supply all desirable data on the question; it may be said that experiments in pots indicate the virtual action of a manure and those in the open ground the useful action, so that unless laboratory work, experiments in vegetation etc., are to be made useless, all questions of manures, preparation of the soil, cultivation of plants, selection, in short all questions which concern agriculture, must be made the subject of experiments on the land. To be of practical utility these experiments on the land must comply with all requirements of scientific criticism : thus the validity of the experimental results obtained must be checked by means of the calculation of errors and by subjecting the products obtained to complete scientific examination. On this subject it may be said that the paucity of the results hitherto yielded by experiments on the land and the discredit in which they are held are due to the non-scientific way in which they were carried out.

A farm viewed in this way not only has for its object to enable scientific investigations of practical utility to be carried out, but it also affords the possibility of checking the value of the experiments of others. Again, the results of all these experiments may serve as guiding suggestions for the farmers of the region.

From this point of view there are some results which have acquired general importance.

Since 1903 experiments have been made with the following series of rotations :

1. Rye and Barley without manure, confirming that the soil is naturally a source of nitrogen.

2. Rye and Barley with 50 kg. (45 lb. per ac.) of soluble phosphoric anhydride, with 300 qls. (12 tons per ac.) of dung, and with the same quantities of phosphoric anhydride and dung together, proving that phosphate manure not only increases the total yield, but also its contents of nitrogen.

3. Fallow - Rye - Barley - Rye unmanured, with phosphates, with dung, with phosphates and dung ; the most interesting conclusion being that fallow land under the somewhat arid conditions of the region accumulates moisture and nutritive substances.

4. Fallow - Winter Rye - Barley - Sugar Beet (with 300 qls. [12 tons] of dung) - Barley - Rye ; the same with leguminous crops ploughed in instead of fallow ; the same with vetches substituted, as in the previous case and mineral manure. Among the results worthy of note there can be cited the better crop of rye after fallow and green manure than after vetches, because the latter crop leaves less moisture in the ground, and further, the better crop of barley after wheat than after beets, though after the beets the barley had a protein content less than 2 %.

Numerous series of experiments were also conducted with regard to the most suitable method of using dung. The following case is of special interest: sugar beet manured with 300 qls. (12 tons) of dung, 200 kg. (180 lb.) of nitrate of soda and 50 kg. (45 lb.) of soluble phosphoric anhydride, followed by four years of cereals and then maize as a green crop; on comparing with a similar rotation, in which however the beets were only supplied with 200 qls. (8 tons) of dung, the rest being distributed in portions of 20 qls. (16 cwt.) over the succeeding crops, the result with regard to the beets was the same in both cases, owing to the insufficient rainfall, while the small plots sown with cereals yielded an excess of 2 to 4 qls. (1.6 to 3.2 cwt.) of grain (with corresponding straw), and 50 qls. (2 tons) extra of green maize.

Experiments in irrigation and watering, in view of the comparative aridity of the region, with the water-table at 4 to 5 metres (13 to 16 ½ ft.) depth also yielded remarkable results. Thus, in 1908, irrigated lucerne yielded a hay crop of 115.8 to 121.7 qls. per ha. (92.1 to 96.8 cwt. per ac.) while non-irrigated lucerne only yielded 40 qls. (32 cwt.) ; the excess production cost 4.04 to 2.53 fr. per ql. (1*s* 7*d* to 1*s*. per cwt.) but these figures can be reduced to 1.20 fr. (6*d*. a cwt.) with a more economical and more suitable distribution of water.

In conclusion, the work of the experimental farm of the Higher Agricultural School of Vienna has not been confined to these branches of agricultural experiment, but experiments were also carried out in the systematic ploughing of the soil, and others are still in progress.

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Agricultural Education in Canada. (Communicated by Mr. J. K. Doherty, Canadian Correspondent of the International Institute of Agriculture).

Canada

There are in Canada six large educational institutions in which instruction in agriculture is given, besides two veterinary colleges : The Ontario Agricultural College, Guelph, Ontario ; The Manitoba Agricultural College, Winnipeg, Manitoba ; Macdonald College, St. Anne de Bellevue, Quebec ; Saskatchewan University, Saskatoon, Saskatchewan ; Nova Scotia Agricultural College, at Truro, N. S., and the Agricultural Institute of Oka, Quebec.

The *Ontario Agricultural College* was established in 1874. It has two main objects : (a) To teach agriculture to boys and men who come from the farm ; (b) To conduct experiments in all the branches of agricultural research, with the object of helping Ontario farmers to make more money on their farms. In this work there are at present engaged, in addition to the President, 15 professors, 2 associate professors, 9 lecturers and 7 demonstrators. The College is in affiliation with the University of Toronto, and there is a four-years' course which carries with it the Degree of B. S. A. (Bachelor of the Science of Agriculture). Then there is a two-years' course, which is rewarded with an Associate Diploma. To reach those who cannot spare the time for either of these, short courses in special subjects, extending from two weeks to three months, are conducted during the winter term. During the past year the attendance has been 1386.

The great service which the College renders to the Province at large is in the experimental work carried on in dairying, chemistry, bacteriology, entomology and botany, and tests made with grain in field plots, and in breeding and feeding. The results are made known through addresses at various public meetings, through press articles, bulletins and reports. In addition, each department handles a large correspondence, and in this way, assists farmers in meeting weed, insect and other problems with which they may be confronted.

The College has lately undertaken the important work of introducing agricultural instruction into the Public Schools, and sufficient progress has already been made to show that it is accomplishing the object in view. A normal course in elementary agriculture and horticulture has been arranged, as well as a summer school at which teachers are instructed in nature study. Last year, 8000 children and over 500 teachers were provided with seeds for garden work. Arrangements have also been made to bring the teachers and their pupils to the College during June excursions, to receive special attention and instruction. In addition, a great amount of work is done by correspondence, both with teachers and pupils.

A very important department of the College is that of forestry. Through this department, the work of reforestation throughout the Province is being developed and encouraged. A course of lectures is given on the care and protection of trees as related to the farm.

The *Manitoba Agricultural College* is one of the new public institutions of Western Canada. During the year 1909, there were 418 students taking the various courses, which include field husbandry, animal husbandry, veterinary science, dairying, horticulture, forestry, entomology, botany and agricultural engineering. In field husbandry special attention is given to farm management, seed judging, grading and selection, soil cultivation, weeds and their eradication, and all operations that are connected with the production of crops.

That the sphere of usefulness of the College might be as wide as possible, the Board of Directors at their meeting in February, 1909, made arrangements to meet the request of the Department of Education to have all second-class teachers, while in training at the normal school, spend a month in residence at the College, where they would have an opportunity of imbibing something of the spirit of agricultural education. The course given to the normal students by the staff includes elementary agriculture, school gardening, nature study, horticulture and home dairying. One hundred and forty-three teachers, besides the school inspectors of the Province, and two of the city principals, took this course during the past year, and are most enthusiastic missionaries for more agricultural education for the boys and girls of the farm.

Macdonald College at St. Anne de Bellevue comprises, among other departments, a School of Agriculture which provides a theoretical and practical training in the several branches of agriculture. The College offers a careful training in many branches, including botany, zoology, bacteriology, physics, chemistry and geology, with special reference to their bearing on the great farm operations of growing crops, breeding and management of stock, fruit growing, cheese and butter making and poultry keeping. The instruction in these subjects is given mainly by the laboratory or scientific method, whereby each student handles, observes and experiments with materials provided for the purpose in the laboratory, field, or stable. Among the courses given are animal husbandry, cereal husbandry, dairying, horticulture, poultry and farm machinery.

A department of the new *University of Saskatchewan* is the College of Agriculture (1). An area of land comprising 1 330 acres has been purchased for the purposes of a college farm and university campus. Administrative buildings, judging pavilion, barns, etc. have been erected. Of the College farm 655 acres are under grain and root crops, while 62 acres are seeded down to western rye grass, timothy, white clover, red clover and alfalfa.

As the centre of agricultural knowledge, this university will be of great benefit to the farmers of Saskatchewan. Instruction is given in all the branches of agriculture. In addition there will be an extension department that will have charge of all agricultural educational work throughout the Province.

This work will include that now carried on by the agricultural Societies under the direction of the Superintendent of Fairs and

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(1) See also *Bull* Nov.-Dec. 1911, No 3102 (*Ed.*).

Institutes, such as institute work, seed grain shows, demonstration plots, short courses, and any work that may be of help to the farmers of the province. The instruction given in the several departments will be suited to the needs of farmers' sons, with a view to giving them a better knowledge of farming and inspiring in them a greater respect for their chosen work.

An interesting phase of the extension work which promises to have valuable and far-reaching effects is a competition in alfalfa growing which is now under way. Ten-acre fields of alfalfa of at least two years' standing will be judged throughout the province in 1914. Several thousands of dollars are offered in prizes, and the railways, the farm press, and the provincial government are co-operating in the scheme.

The *Nova Scotia Agricultural College* gives a two-years' course in the various branches of agriculture. It also gives Short Courses which are attended by a large number of farmers who would not have time to take a regular course. The College has organized a Rural Science School at which, in 1910, 81 teachers actually engaged in teaching in the Province, spent the greater part of the summer vacation, where they studied plants, birds, insects and soils, and various phases of agriculture and horticulture, with the view to using the knowledge they acquired in the rural schools under their charge.

The *Agricultural Institute of Oka* is affiliated to Laval University at Montreal, Quebec. Courses of instruction are given in all branches of agriculture, vegetable production, animal husbandry and rural industries.

The *Veterinary Colleges* are situated one at Toronto, Ont., and another at Montreal, Quebec. The former, the Ontario Veterinary College, is affiliated with Toronto University. Since 1886 this College has sent out over three thousand graduates in veterinary science. A thorough three-years' course of instruction is given, leading to the degree of B. V. Sc. During the past few years special attention has been given to research work into the causes of disease. The public demand for pure and healthful food has recently caused the more scientific inspection of meat supplies, and veterinarians, especially trained for the purpose, are instructed to do the work. This has caused the addition to the curriculum of a course in Meat Inspection as well as sanitary inspection in other lines.

The College at Montreal consists of a branch of Laval University. It furnishes a three-years' course and a Degree, all of which correspond closely with those provided by the Ontario institution.

College Extension Work.

A service of great importance in agricultural education was inaugurated by the Ontario Government in 1907. This is the appointment of local district representatives. The object in view is to impart agricultural instruction in the High Schools, so that the rising generation might be trained for farm-work ; and at the same time to bring the most up-to-date agricultural information to the very doors of the farmers who have not had an opportunity of acquiring it in their youth. Accordingly the policy was worked out jointly by the Department of Education and that of Agriculture. It is arranged that the Department of Education shall pay the salary of $ 1200 per year, that the Department of Agriculture shall bear the cost of assistance and general expenses, which experience has shown amounts to about $ 1000 per year per representative, and that the local County Council shall be required to contribute $ 500 annually towards equipment. Arrangements have been made to establish courses in agriculture on a par with the courses in English, classics, mathematics and science.

An office is opened in a town and equipped with agricultural publications and other requisites. This office is a central, convenient place, where the farmer can drop in and discuss his problems with a man who has given these problems special study. It is a place where the farmer can have access to the latest bulletins or periodical publications on agricultural topics, and a meeting-place for committees or officers of farmers' organizations—in a word, the centre from which radiates all the organized agricultural activity of the district. The work has now developed to the extent that there are fourteen of these representatives in fourteen different local centres, including three appointed during the past year. Each one of them has an assistant, who is also a graduate or third-year student of the College.

" Short courses " is the name given to a practical education plan carried out by the representatives under the supervision of the Farmers' Institutes Branch. They take place during the winter and occupy two, three or four days. During that time sessions are held morning, afternoon and night, and practical talks are given by experts from the Agricultural College, or elsewhere, on horses, cattle, seed judging and kindred subjects. These talks are emphasized by ocular demonstration. If the subject is horses, then a horse is brought into the ring, and the good, as well as the weak features pointed out. Then questions are asked and answered, and a practical discussion follows. Although it is only three years since the first short course was held in the Province, they have grown in favour and usefulness so rapidly that some twenty-five were held during the past year, and were attended by over 10 000 farmers. Similar courses are carried on in most of the other provinces by the Agricultural Colleges of the Farmers' Institute organizations.

In some of the counties, special attention is being paid to the rural public schools. In one county, half a dozen schools have been interested in growing farm crops and making nature collections. The pupils were given seeds to take home and sow according to directions. They cared for and harvested the crop. Prizes were given for the best results at a rural school fair. In almost every township of two other counties a corn fair was held in the schools, and in many instances there were as many as one hundred exhibitors.

The Agricultural School at Victoria, Kamerun. (Die landwirtschaftliche Schule in Victoria). — *Deutsches Kolonialblatt*, Nr. 23, p. 896. Berlin, 1. Dezember 1911. 2

The first course of agriculture in the School at Victoria, Kamerun, was begun in October 1910 with 20 native scholars.

One hour every day is devoted to instruction on special crops, planting of nurseries, and propagation. Kam

The practical work is specially to do with nurseries, with gardening, and with seed preparation, cocoa picking, and the ordinary day's work of the season.

German, book-keeping, and geography are taught three times a week.

At the conclusion of this course, which is to last three years, it will be necessary to appoint a permanent instructor in gardening.

W. B. MERCER and A. D. HALL. **The Experimental Error of Field Trials.** *The Journal of Agricultural Science*, Vol. IV, Part 2, pp. 107-127 + fgs. 9 + tbl. IX + app. Cambridge, October (November 11), 1911. 2

The magnitude of experimental error attaching to one or more plots is a question of extreme importance in agricultural science, because upon its proper recognition depends the degree of confidence which may be attached to the results obtained in field work. Uni King

From the Rothamsted plots Hall has already shown that the probable error attaching to a single plot is in the neighbourhood of plus or minus 10 per cent. There are, however, two methods of reducing the experimental error to a negligible amount, one by repeating the experiment over a long period of years, the method which has been adopted with the old experimental plots of Rothamsted, or secondly, by multiplying the number of plots on a given field. The first method does not eliminate casual variations induced by type of soil, the second is also subject to errors due to the season. There are, however, many occasions and many types of experiments in which it is desirable to obtain reasonably accurate conclusions from a single season's work, and the practical point at issue is the size and number of plots which are most likely to reduce the inevitable error within working limits.

In order to obtain light on this question, during 1910 an attempt was made at Rothamsted to estimate the variations in the yield of various sized plots of wheat and mangolds, which had been subjected to no special treatment and appeared fairly uniform.

From the results the following general conclusions may be drawn:

1. In all field trials, however uniform the land and careful the management of the experiment, there will be an experimental error attached to the result, due to so many incalculable factors that it may be described as casual.

2. The error diminishes with the size of the plot, but the reduction is small when its area rises above 1/40 of an acre.

3. The error may be best diminished by increasing the number of plots similarly treated, and scattering them about the area under experiment, but there is not much to be gained by increasing the number above five.

4. For practical purposes, the writers recommend that in any field experiment each unit of comparison (variety, method of manuring, etc.) should be given five plots of 1/40 of an acre each, systematically distributed within the experimental area.

This will reduce the experimental error to within 2 per cent. of the result, if the land is at all suited for experiment ; it does not, however, eliminate variations due to unequal effects of different seasons. Such variations can only be eliminated by continuing the experiments for several years. Similarly, variations induced by the type of soil can only be ascertained by repeating the experiments on several soils.

AGRICULTURAL INSTITUTIONS.

French Permanent Commission for the Study of Colonial Cultures and Experiment Gardens. (La Mission permanente d'études des cultures et jardins d'essai coloniaux en France). — *La Quinzaine Coloniale,* No. 21, p. 741., Paris, 10 Nov. 1911. 30

France

A decree dated the 27th. October 1911 established in the Colonial Ministry a permanent Commission for the study of colonial cultures and experiment gardens, consisting of a chief, appointed by decree, an assistant chief of the Commission appointed by decree of the Colonial Ministry, and selected from among inspectors of agriculture, inspectors of forests or directors of colonial experiment gardens. M. Chevalier was appointed extraordinary Chief of this Mission. He was instructed to prepare an inventory of the vegetable wealth of Guinea and the Sudan for a period of 10 years.

HJALMAR von FEILITZEN. **The Work of the Association for Cultivation of Peat Moors in Sweden during the First 25 Years of its Existence.** (Hvad har Svenska Mosskulturföreningen uträttat under de gangna 25 aren?). — *Svenska Mosskulturforeningens Tidskrift,* XXV Argang, No. 7. Extrahäfte Jönköping, 1911. 31

Sweden

At the meeting held at Tenhult on the 25th January 1886, the bases were laid of an Association for cultivating the peat moors in that province. At the first meeting of that Association, held at Nässjö, it was decided to extend the study to the moors of central and southern Sweden.

The object of the Association, according to the first paragraph of the Articles, was:

1. To unite those interested in the cultivation of peat moors in order the more effectively to study this important national problem.

2. To make known rational methods of utilising peat soils and cultivation on them, by lectures, publications, meetings, debates and other means.

3. To stimulate and assist experiments in various methods of cultivation and improvement of these soils, methods for the manufacture of peat fuel, peat coal, peat litter, and also the application of peat for improving the soil.

At the meeting of the 10th January 1888, it was decided to extend the work of the Association to the whole of the country, and to change its first name into that of " Association for the Cultivation of the Peat Moors of Sweden. "

In the very first years, repeated petitions were addressed to the Government to secure the following objects : the use of peat fuel in State railway locomotives ; the increase of State grants for the work of reclamation of the marshes from $^1/_3$ to ½ of the actual cost ; the reduction to 4 % of the interest payable on loans contracted for the cultivation of peat moors; the conversion of the State peat moors into so many colonies for young workers, or their appropriation, after reclamation, for planting forest ; finally, the reduction of the freight rates on lime and manure by 50 %, and also the reduction of the freight rates for peat fuel and litter.

The Association in 1903 found its wish to possess its own experimental station realised. To-day the staff of this station numbers a botanist, two chemists, three engineers for the cultivation, and the necessary assistants, an inspector at Flahult and a chief of cultivation at Torestorp. The work of the station comprises three perfectly distinct parts : scientific investigation, practical application, and the making known of improved methods of culture (answers to enquiries, reports etc.).

The scientific investigation up to 1911 includes studies made in 22 of the 24 provinces of the Kingdom, on 6 468 peat fields. 9 083 specimens of peat were analysed under the microscope ; 2 791 investigations were made into the botanical composition of grass lands, 1 548 analyses of hay, and 10 930 examinations of seed.

The chemical laboratory analysed 4 000 samples of peat soil intended for cultivation, 1 500 samples of peat-moss litter and 1 600 of peat fuel, from all parts of the country, forming valuable material for ascertaining the qualitien of the peat moors in the different provinces. Analyses were also made of soils under cultivation, manures, lime, and other substances connected with the experimental station.

The experimental fields now number 226, scattered throughout the country ; they have altogether an area of 62.6 ha. (155 ac) divided into 4 010 plots. A sufficient idea may be formed of the development of cultivation by owners of moors when it is stated that in 1910 the engineers of the Association held consultations on the spot on 338 estates. Besides these visits, instructions are supplied in writing.

Propaganda work of improved methods of cultivation was carried out, not only by visits to the spot, but also by short treatises and booklets, articles in special reviews, lectures, educational travels abroad, and exhibitions, where lectures were held in large numbers with lantern views. In 1910, 108 lectures were given in 16 different provinces.

Since 1908 lectures have been given alternately in the Agricultural Institutes of Sweden (Alnarp and Ultuna). Reports were presented to the Congresses at Christiania, Copenhagen, , Berlin, Vienna, London, etc.

Since 1906, special courses of study have been held for the cultivation of peat moors; these courses are held at Jönköping, and are attended by farmers from all parts of Sweden.

The Association, which numbered 138 members in 1886, had 2 678 in 1910.

H. L. RUSSELL. **The Agricultural Extension Service in Wisconsin.** *Twenty-seventh Annual Report of the Agric. Exp. Station of the University of Wisconsin*, pp. 31-47. Madison, Wisc., 1911. **82**

United States: Wisconsin

Since the foundation of the system of American Agricultural Experiment Stations, a large part of the work and duty of these institutions, has been to carry on a propaganda for the adoption of improved methods of practice. Where these methods did not exist, they had to be worked out, but after their discovery, the necessity of securing their adoption became an equally important duty and privilege of the station. The result has been that research, and extension of research, in terms of common practice to the occupant of the soil have been so closely co-ordinated in the work of the most successful stations, that it is with difficulty that the respective lines can be separated. The writers report presents only the more practical aspects of the principal lines of work done by the Agricultural extension service of the Wisconsin Experiment Station. The high degree of success attained by the community breeders' associations for dairy cattle, has led to further increase, and during the last year ten new organizations have been started, making in all 37 of these enterprises in 27 counties that are specifically concerned in dairy cattle improvement.

The official authentication of dairy cow records has greatly increased this last year, 872 animals or 61 % more than the year before, having been tested as to production by the University supervisors. The inauguration of the Wisconsin Dairy Cow Competition has greatly stimulated interest in the matter of actual performance of dairy animals, over 400 cows having been entered in the competition for prizes aggregating $ 2600, which have been offered by persons interested in the development of dairy cattle breeding.

The passage of a law by the last legislature, requiring the testing of all dairy and breeding cattle intended for sale, has greatly stimulated the educational campaign against the scourge of bovine tuberculosis. The post-mortem demonstrations held in co-operation with the Live Stock Sanitary Board, at the farmers' courses at the different county agricultural schools, the State fair and the various county fairs have greatly contributed to the application of the tuberculin test. The Sanitary Board has the matter of distributing tuberculin in its charge and the campaign in the State is steadily progressing, each year showing a constant increase in the number of tests made. During the four years that butter and cheese scoring exhibitions have been under way, monthly entries have been received from 618 creameries and 458 cheese factories in the State. The scoring work is done by the Dairy Department with the co-operation of inspectors from the State Dairy and Food Commission, and the U. S. Department of Agriculture. The products of the members of the scoring exhibitions, at the annual conventions, fairs and dairy shows, have always proved to be of superior quality. This is also due to the fact that the Department of Agricultural Bacteriology has co-operated with the Dairy Department in sending out pure culture starters to the creameries and cheese factories who participate in the Butter and Cheese Scoring exhibitions. About 150 factories have received such cultures on application during the year.

The work of revolutionizing the type of seed grain throughout the State is being pushed by the Department of Agronomy with much vigour. A unique organization to accomplish this purpose is had in the membeship of the Wisconsin Experiment Association, which now numbers over 1500 paid-up members.

Membership in this organization entitles the holder to receive a small assignment of the selected and pedigreed grains that have been developed at the College. These are grown in increase plots for the first year, and by the second season, the grower is in a position to market his selected seed at good prizes. A large sale of these selected and pedigreed stocks takes place now not only in Wisconsin but all over the country. It is estimated that the members of the Experiment Association sold last year not less than $ 300 000 worth of selected seeds. The organization of the County orders of the Experiment Association, uniting all members in a single county, has been necessary to control more closely the work of inspection. These county orders now make collective county exhibits at the State Fair and other seed meetings. The increasing importance of the Young People's Grain Growing Contests is shown by the fact that 50 contests were scheduled in 36 counties last year, including 20 000 tests.

The selected seeds furnished by the Agronomy Department were distributed to the school children through the co-operation of the County Superintendent of Schools and County Fairs Secretaries; all instructions were given for the care and culture of the same. Over 6000 exhibits were made at the county fairs this fall, and last year over $ 2200 in prizes were distributed by the various fair authorties.

The State and County Farm demonstration work, has been continued along the lines begun last year and extended to twenty farms. Thirteen all-day meetings were held with a total attendance of 4150 farmers. Lectures were given on the demonstration fields, pointing out the important features shown by the crops and presenting the methods employed to obtain best results. These fields were mostly located near traveled roads, and with the possibilities for visiting afforded on public farms and the co-operation of local editors in printing timely notes on the crops, the work was kept before the farmers during the whole season. Orchard and potato spraying demonstrations were also made.

For several years the Horticultural Department has offered to make planting plans for two schools, or other public grounds, in each county.

The improved selections of Connecticut-Havana tobacco which were previously developed at this Station by the Horticultural Department have been disseminated for six or seven years by distributing small quantities of seed to tobacco growers. The results obtained in this seed distribution have so far been very gratifying. During the past season 1322 growers, living in 58 counties, were furnished with 175 pounds of high grade seed valued at $ 1400.

The Substations for experimental work also, located in the northen part of the State, are generally regarded now as one of the most important factors in the development of these regions. During the last five years in which the drainage service has been in operation, aid has been given by the department to the reclamation of 116 000 acres for which plans have been prepared and perfected. The improvement of 33 000 acres has already been performed or is now in actual progress.

In spite of the fact that Wisconsin, through its wide development of the live stock industry, has perhaps depleted the fertility of her soils less than almost any other State, yet the co-operative fertilizer tests, carried on by the department of soils, have already indicated the necessity of careful attention being given to the matter of soil fertility. Nearly 200 co-operative tests were conducted last year on the special fertilizer requirements of the clay, marsh and sand soils.

85 **The Tenth Rural Congress of Uruguay.** (10° Congreso Rural). — *Revista de la Asociacion Rural del Uruguay,* No. 9, p. 641-659. Montevideo, Sept. de 1911.

At the Tenth Rural Congress of Uruguay, held recently, the two following resolutions were adopted.

Uruguay

The Tenth Rural Congress holds that the public authorities should, as an urgent measure, compel railways to adopt cold storage waggons for the transport of milk.

The Tenth Congress would view with satisfaction the formation by the executive authorities of Uruguay of a permanent national Refrigeration Association, which, in conjunction with the International Association, should make it its task to popularise and secure the adoption of the different exceedingly important applications of refrigeration to the meat industry and all other agricultural industries which, now in a rudimentary condition, might, by the use of refrigeration, become exceedingly important to Uruguay

CROPS AND CULTIVATION

AGRICULTURAL METEOROLOGY.

86 N. Trage. **On the Occurrence of the Daily Minimum Temperature at the Surface of the Soil.** (O Nastuplenii Sutochnago Minimuma na Poverkhnosti pochva). - *Xurnal Opetnoi Agronomii* (Revue d'agriculture expérimentale). G. XII, Kniga 6, p. 773. S. Peterburg, 1911.

Russia

The problem of the occurrence of a daily minimum of temperature at the surface of the soil in the course of the 24 hours is not yet completely solved. This minimum coincides with sunrise according to the old enquiries of Vild.

The Author, in this connection, made a series of observations in June 1910, using a Richard thermograph which he placed at a height of 5 mm. above the ground. The data obtained during the course of 32 days show that this minimum on foggy days really coincides with sunrise, while on fine days it is about 30 minutes later.

This conclusion is confirmed by the observations made during 10 years, for every hour of the day, at the Observatory of Ekaterinburg. During the summer months it was found that the mimimum temperature is half an hour after sunrise and that this interval grows less and less as the winter approaches. In December and January there are two minima, one at midnight and the other at sunrise. (1)

87

H. A. Dimo. "**Turkestan Fogs" in the Government of Saratov.** (Is Nabliudenii pod " Mgloi " v. Saratovskoi Gubernii). — *Journal Opetnoi Agronomii* (Revue d'Agriculture expérimentale). G. XII, Kniga 5, pp. 699-700. S. Peterburg.

Russian Empire: Turkestan

" Turkestan Fogs " in the south-eastern regions of Russia form a characteristic phenomenon which has hitherto received little study and of which the native populations stand in great fear, in consequence of the mischief done to agriculture.

Their appearance is pretty regular ; it takes place twice a year: in spring (April) and about the end of summer (July-August).

These are dust fogs, which the east winds raise in the deserts of central Asia and which they convey and scatter afar, when meteorological conditions allow. These fogs lower in a very noticeable proportion the degree of moisture in the atmosphere, and by forcing the processes of transpiration, they have a disastrous effect on the life of cultivated plants.

On the other hand the observations which the author undertook during 10 years in the Government of Saratov go to prove that in reality there is no relation between the condition of the harvests and the appearance and duration of these fogs. Hence the necessity of methodical study of the phenomenon, both in itself and in relation to the problems of vegetable physiology apparently connected with it.

The author gives a detailed series of descriptions, particularly of the " Vessennaia Mgla " (spring fog), which is the more characteristic and distinct in appearance. The description is illustrated with tables which show the changes in pressure, the temperature, the degree of moisture of the atmosphere, the wind velocity, rainfall, etc. Many particulars are given as to the quantity and chemical composition of the dust. It appears that in the " Vessennaia Mgla " the material transported is of desert origin, while in the "Lietnaia Mgla" (summer fog) it is almost entirely of local origin.

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(1) The exact determination of the daily minimum is of some importance in forecasting frosts, and consequently in putting into operations means which may serve to limit its harmful effects. (*Ed.*).

The author lays stress on the necessity of creating a special network of stations in south-eastern Russia for the study of the phenomenon, and also its importance from the physiogeographical point of wiew in the process of formation of saline deposits in the soil.

88 HENRY HUBERT. **The Condition of Formation of Storms in the Sudan.** (Le mécanisme des Orages au Soudan.). — *La Géographie, Bulletin de la Société de Géographie*, XXIV, No. 4, pp. 232-242. Paris, 15 Octobre 1911.

Sudan

The prevailing winds throughout West African countries lying between 9° and 16° N. arise from two aerial currents: the Harmattan and the Monsoon.

The Harmattan is a remarkably dry wind which prevails throughout the year, coming approximately from the east; it blows constantly throughout the dry season at the surface of the ground and during the winter season at an altitude of at least 1 000 metres (3 300 ft.).

The Monsoon on the contrary goes from the coast towards the interior of the Continent. It blows less continuosly and for a shorter period, its force and velocity however become appreciable above the zone of verdure which covers the entire country between the surface of the ground and an altitude of 800 metres (2 600 ft.) The Monsoon only appears during the rainy season.

During the winter the two currents are superposed. The Monsoon carries the rain, and the rainy season is flanked by two storm seasons, which result from the conflict of the air currents. At the time when the two currents come in contact, the condensation of watery vapour will naturally be promoted in the zone where the commingling of the two masses of air takes place. Furthermore the friction of the air masses against each other will act as a cause producing electricity, and the more effectively in proportion as the direction of the currents results in a very high relative velocity.

Some observed facts are here given showing that the creation of storms appears closely bound up with the conflicting action of the two winds:

1. In winter, when the Harmattan alone blows, storms never occur.

2. During the winter season in the southern regions, when the Monsoon has clearly set in, storms never happen.

3. During the winter season throughout all regions, the storm periods are those when the Monsoon sets in at the surface of the ground at the cost of the Harmattan, or ceases and is replaced by the latter.

4. If in the middle of the winter, when the Harmattan is blowing, an appreciable change is observed in the direction of the wind, a storm follows within a very short time.

5. During the winter, when it is seen that the under strata of the Harmattan are fairly low down, a storm is always produced.

By a happy chance it has been possible to determine the movement of translation and the velocity of the storms. The stations at Kourg, which are localities combining the most normal geographical conditions of the Sudan region, at 180 km. (112 miles) distance from each other and connected by telegraph, are on the path of travel of the same storms, so that in the first place their position on the map gives a strictly accurate direction of movement. The measurement of the speed made between these two stations was found to be 60 to 75 km. (37 to 46.5 miles) per hour.

The storms convey to the west the moisture brought from the south by the Monsoon owing to the preponderating part played by the Harmattan, in the mechanism of the storms. The regular rains are from the south and the storm rains on the contrary from the east. This is observed in some regions where no regular rains can take place, and where, whenever rain does fall, it will be a storm rain from the east. These regions are in the north. All winter days may be storm days ; in the southern regions, on the contrary, the storms occupy a very small part of the winter season, before and after a period marked by the rainfall brought by the Monsoon. The separating limit of the two zones is evidently a sinuous line, and the data for tracing it out on the map are wanting. Nevertheless it seems that in the bend of the Niger it constantly lies between 12° and 13° N.

The foregoing observations, although they only relate to the Sudanese regions which are visited, apply to all territories lying between Kayes and Zinder. It follows that the Harmattan has a preponderating influence over the movement of translation of storms, while the Monsoon has a preponderating influence on their production. Altogether the observations cover more than 100 storms, and were carried out in the course of two years' travel, that is to say, under conditions when it is of particular interest to forecast the weather.

39 A. Müntz and E. Lainé. **Ammonia in the Rain and Snow at the Observatories of Charcot's Expedition.** (L'ammoniaque dans les pluies et les neiges des stations d'observation de la Mission Charcot). — *C. R. de l'Acad. des Sciences*, T. 153, No. 17, pp. 749-750. Paris, 23 Octobre, 1911.

Antarctic Regions

At the time of Charcot's expedition to the South Pole, M. Godfroy took four samples of rain at Port Circoncision, at the Island of Deception, and at Tuesday Bay (extreme west of the Straits of Magellan). He also took 14 samples of snow in the same localities.

Accurate analysis has proved that the proportion of ammonia in these samples of rain water and snow does not differ appreciably from that which had already been observed at various stations in Europe.

AGRICULTURAL GEOLOGY.

40 A. J. Nabokikh. **Study of the Steppe Soils in Southern Russia.** (Sostav i Proiskhoxdenie Raslichikh Gorisontov Niekotorihk yuxnorusskikh Pochv). — *Xurnal Opctnoi Agronomii* (Revue d'agriculture expérimentale). T. XII, Kniga 4, pp. 553-554. S. Peterburg, 1911.

Russia

The distribution of the different types of soils at different depths is closely bound up, from the genetic point of view, with the chemical transformations taking place in the mass of bed rocks, so much so that it is necessary that chemical investigations into the soil should be accompanied by a detailed study of its structure.

The Author deals with the distribution of silica in the sandy (steppe) soils of Russia, and he draws the following conclusions from a large quantity of analytic data. In the steppes covered only with herbaceous flora there is a certain immobility of the silicated minerals, that is to say, the latter do not accumulate progressively towards the surface ; this is explained in the first place by the granular structure of the soil, which renders it highly permeable, and in the second, by the fact that after their death the vegetative parts below the ground, in which silica chiefly accumulates, are carried away by the rain and the wind and deposited on the lowest spots in the locality. Here the rapid decomposition of the minerals separates the silica from the silicates in the form of very fine sand, which enriches the most superficial layers, giving them a sandy character and flaky structure.

Sometimes beds of silica are met with, floury in appearance, in the subsoil. The Author explains this fact as follows: The water removes and deposits the silicates in the form of SiO_2 (Silica), which accumulates, and of sesquioxides of silicon, which are brought towards the surface again by plants.

In the zone of Loess steppe, now covered with wood, the great moistness of the superficial strata promotes the decomposition of the soil and results in the formation of what are called decomposed black earths and forest clay.

All these processes, which tend to give the ground a sandy appearance and granular structure, occur in the most varied geological formations (tertiary clays, laterites, etc.), both in the Northern and the Southern steppes.

It should be noted notwithstanding, that the proportion of silica is higher in the Northern steppes, as is shown by the following particulars for the different Governments: Steppes of the Don, Iekaterinoslav, Saratov, 65 %; Taurus, Kherson and Bessarabia, 67 to 70 %; Kursk, Podolia, Poltava, Kiew, 72 to 75 %; Cernigov and Vasilko 80 to 84 %.

In conclusion the Author sets out a few personal opinions of a general character as to the southern limit of the Aeolian formation.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY.

J. DUMONT. **A New Method of Physical Analysis of the Soil.** (Sur une nouvelle méthode d'analyse physique du sol.). — *C. R. Ac. des Sciençes*, T. 153, No. 19, pp. 889-891. Paris, 6 Novembre 1911. 41

M. Dumont has already shown in a previous communication (*Comptes Rendus*, T. 149) that the sandy particles extracted from the soil by simple levigation are in most cases covered with a clay-humous layer of fairly complex constitution. In strong compact soils, where colloidal elements abound, the presence of these coatings may falsify analytical results. In order to obtain more concordant figures

France

as to constituents, it is essential, before any other treatment, to break up the coatings by treatment with dilute oxalic acid. On the other hand a separation of the silt and clay fractions is always effected more rapidly and completely by centrifugalisation.

These considerations prompted the Author to elaborate a new method of physical analysis of arable soils, comprising the following operations :

1. Determination of lime and treatment of the fine earth with oxalic acid. The lime is calculated according to the volume of carbonic acid given off by treating the sample of arable earth with an excess of oxalic acid. The fraction of free oxalic acid, remaining after the reaction, is determined by calculation. The washing is effected by boiling the earthy residue in the solution of oxalic acid brought down to a strength of 2 % by adding the necessary quantity of water.

2. Dissolution of the humous substances and separation of the sands by sedimentation. The dissolution of the humous substances is effected in an ammoniacal solution in which the earthy residue of the previous operation is boiled. The coarse sand and total sand are determined by sedimentation.

3. Separation of the silt and colloidal constituents by centrifugal action. After separation of the sand, the liquid contains in suspension the mineral colloids and the silt, which can be separated, and their proportions determined, by centrifugalisation for 15 minutes at an average speed of 1 000 or 1 200 revolutions per minute. In two operations the silt can be separated from the fine silt. During centrifugalisation the clayey and colloidal constituents remain in suspension in the solution of ammoniacal humate.

4. Determination of the mineral colloids and humous compounds. By means of carbonate of ammonia the clayey and colloidal compounds are coagulated and again separated by centrifugalisation. By evaporating the remaining liquids the humic constituents are ascertained and the proportion of ash determined by incineration.

This new method presents very many advantages ; among others that of allowing the carrying out in a single half day, with the utmost accuracy, of complete separation of the essential components of the soil.

M. WEIBULL. **The Reaction of Arable Lands and its Importance for the Study of Soils and their Fertility.** (Betydelsen af akerjordens reaktion vid jordundersökning och för bördigheten). *Kungl. Landtbruks-Akademiens Handlingar och Tidskrift*, 15 A., No. 5, pp. 388-409. Stockholm, 1911. **42**

Sweden

The object of the present enquiries is the determination of the relations between the reaction (acid, neutral, alkaline) of a soil and the solubility of fertilising substances, and to ascertain whether the action of manures and the production from the soil are also dependent on a factor of this kind.

It had already been noted that the proportion of nitric nitrogen is greater in alkaline soils than in acid soils, and therefore that alkaline soils are more favorable to nitrification. In a series of experiments carried out on the soil in different localities of Scania, the Author found that, other things being equal, the content of nitric nitrogen was far greater on alkaline plots than on acid plots and likewise greater on neutral plots than on acid plots. Besides, the crop was smaller from acid soil than from neutral or alkaline. These results go to confirm those furnished by a series of experiments in manuring, carried out from 1907 to 1910 on 146 different plots of land. The average result is that the demand for nitrogen by the plants tested — Oats, Barley Potatoes. Mangolds and Sugar Beet — is at its maximum in acid soils, is less in neutral soils and is at its minimum in alkaline soils. The action f nitrogen, nitrate of soda for instance, is generally strong in acid soils; that is to say that in these soils not only small applications but plentiful applications of nitrogen have noticeable effects, while with the exception of Mangolds, in alkaline soils the plants experimented on show no perceptible reaction. This different behaviour of acid and alkaline soils is more manifest with Cereals and Potatoes, less so with Beets.

As to the action of phosphoric acid, investigations made in parallel series in Malmöhus, have shown that the quantity of soluble phosphoric acid (in $^N/_5$ nitric acid : Stoddard and Traps) averages 0.0105 % in acid soils and 0.021 % in alkaline soils; the content of assimilable lime is less in acid soils, and so is the crop. Generally, acid soils need phosphoric acid, and this is confirmed by fertilising experiments. Indeed, although generally the action of phosphoric acid has been less perceptible than that of nitrogen, the difference with regard to the various soils was as clear; thus, with Barley the action of phosphoric acid was fairly powerful in acid soils, merely perceptible in neutral soils and at its lowest in alkaline soils ; with Mangolds, a plant highly sensitive to the action of manures, the effect of phosphoric acid was very divergent, being intense in acid soils and barely perceptible in alkaline earths. A preliminary deduction may be made from the acid reaction of the soil as to whether it needs phosphoric acid, but to make certain, recourse must be had to determining the soluble phosphoric acid contained in that soil. Though in alkaline soils the need of phosphoric acid is not so pronounced, and these soils have greater average soluble contents of that acid, it seems nevertheless that in regard to them no relation exists between the contents of soluble phosphoric acid and the reaction to phosphate manures.

From the determination of the potash soluble in $^N/_5$ nitric acid and in saturated lime water, it results, with a few exceptions however, that acid soils contain no less than alkaline soils and that the former need it no more than the latter. Yet the question of lesser contents of soluble potash in acid soils than in alkaline still requires study, as well as the corresponding analytical methods. However the case may be, cultivation experiments would seem to confirm that for all the plants considered above, there is a considerable need of potash in acid soil ; in alkaline soils, only Mangolds showed noticeable need of it, and Potatoes a slight need ; the other plants on the contrary did not react to potassic fertilising.

From this general lesser solubility of fertilising substances in acid soils, it would follow that the latter, without the use of manures, can only give poor crops, while the application of soluble chemical fertilisers would result in a fair return in crops. Thus for instance, while Oats yielded a total average crop of 20.4 quintals per hectare (16.3 cwt per acre), in acid soils they gave 15.7 quintals (12.5 cwt per acre), in neutral soils 19 quintals (15.2 cwt per acre), and in alkaline soils 24.9 quintals (19.8 cwt per acre) ; in general all the crops decline from a maximum in alkaline soils to a minimum in acid soils, and this is likewise true for soils which have been given a complete manure.

The extra yield obtained by addition of a complete manure attains its maximum in acid soils, is less in neutral soils and least in alkaline, but the difference between the extreme cases is relatively small ; calculated in dry substance, it is about 2 quintals per hectare (1.6 cwt per acre).

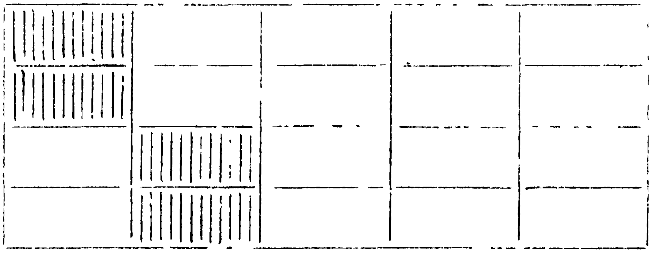
Nevertheless, calculating the extra yield as percentage of the total, the difference becomes more substantial. Thus, for Oats the surplus obtained with complete manure is about 50 % in acid soils, as against 30 % in alkaline, and the same is the case for other plants.

The following table gives the extreme differences, both their percentage and absolutely.

SOILS

	Acid		*Neutral*		*Alkaline*	
	Extra yield		Extra yield		Extra yield	
	Absolute cwt. p. acre	Per cent	Absolute cwt. p. acre	Per cent	Absolute cwt. p. acre	Per cent
Oats	3.6 — 7.80	25.6— 36.7	3.82— 7.06	20 —93.5	2.23 10.74	9 — 77 —
Barley . .	4.4 — 9.39	25.5 61.5	3 06— 7.96	17.6—55.7	1.91— 5.73	10 — 45.6
Sugar Beet .	24.68—106.64	11.2— 49.8	35.82— 85.97	13.3—63.2	16.72—103.48	6 — 48.3
Mangolds .	211.73—319.19	61.4—166	175.12—212.53	36.5—68 7	144.87—312.03	26 —146
Potato . .	35.02 66.07	25.3— 67.2	22.29— 29.45	30.9—47.1	24.68— 57.31	23.7— 29.8

Other noteworthy conclusions of great practical value and of general significance can be drawn from enquiries into the chemical nature of the soil and the cultivation experiments carried out. Above all, since the influence of the chemical reaction of the soil on the need of that soil for chemical fertilisers and on the amount of the corresponding crop is so considerable, it will always be necessary to determine this reaction. Account must further be taken of the fact that this reaction changes for the same soil, as is clearly proved by the following division into plots observed at Bomhög.



The shaded plots are alkaline in reaction, the dotted plots neutral, and the blank plots acid. Consequently in every soil investigation and growing experiment, the reaction of the soil must always be determined systematically in order to enable the importance, value and significance of the results obtained to be measured.

In conclusion, it is *a fortiori* essential to determine systematically the reaction of the soil in manuring experiments, because the different manures, for instance nitrate of soda, sulphates, ammonia, calcium cyanamide, etc., may act diversely according to the state of the soil.

48 W. SCHNEIDEWIND, D. MEYER and F. MÜNTER. **Enquiries as to the Balance of Nitrogen in the Soil.** (Untersuchungen über den Stickstoffhaushalt des Bodens). — *Fühling's Landwirtschaftliche Zeitung*, 60. J. 22. H. p. 780-791. Stuttgart, 15. November 1911.

It is now a well known fact that in agricultural soil a balance is struck between causes tending to increase the nitrogenous contents and other causes tending to the diminution of nitrogen.

Germany

The factors of this equilibrium or balance of nitrogen in the soil may be summed up in the following terms :

Gains :

a) Nitrogen introduced into the soil by rainfall and the absorption of ammonia by the humus.

b) Atmospheric nitrogen fixed by specific organisms living freely in the soil.

c) Atmospheric nitrogen fixed by bacteria living in symbiosis in the nodules of Leguminous plants, in so far as the substance of the latter is directly or indirectly incorporated in the soil.

Losses :

a) Produced by certain bacteriological processes, denitrification and putrefaction.

b) Evaporation of ammonia.

c) Washing out of soluble and dissolved nitrogenous substances, particularly nitrates.

In addition to these phenomena and simultaneously with them a continuous conversion takes place of insoluble nitrogenous substances into soluble ones— ammonia, amides and nitrates, and conversely these soluble nitrogenous substances are converted into insoluble ones, again by bacterial action.

The final result of all these actions represents the grade of nitrogen, total and useful, contained in the soil. Nevertheless to determine the fluctuations in this balance, very minute and precise experiments and measurements are requisite. For this object the Authors marked off in the experimental field of Lauchstadt fixed, double plots, untreated and treated with a proportion of 20 qls. per ha. (16 cwt per ac.) per annum of sugar, straw and peat. One series of plots was cultivated : Mangolds 1909 ; Oats 1910 ; Potatoes 1911. The other was left fallow.

According to the analyses of samples of the soil, the balance in the different cases is :

	Cultivated. Nitrates gained per annum		Uncultivated. Nitrates lost per annum	
	kg. per ha	lb. per ac.	kg. per ha.	lb. per ac.
Without organic matter	19	17	97	86
Sugar	34	30	105	94
Straw	36	32	89	79
Peat.	42	37	92	82
Average . . .	33	29	96	85

These general results, which in their elements agree with those of Krüger for fallow soils, lead to the following conclusions, which are of immediate practical value because they fall in with the results of the static experiments conducted on a large scale by Lauchstadt and other private experiments carried out by the Authors themselves and others.

1. An uncultivated soil undergoes a reduction of nitrogen. The nitrogen in fallow land is to a great extent converted into nitrates; these nitrates and other soluble forms of nitrogen created in the soil by the useful bacterial and chemico-physiological phenomena of this soil, are conveyed by the waters into the deeper strata and are partly also decomposed Lying fallow for one year suffices to render useless for a subsequent culture the greater part of the nitrates formed, which results in a more or less great exhaustion of nitrogen.

2. The cultivated soil is liable to a minimum reduction of nitrogen, while large quantities are taken away in the crops. The formation of nitrates is smaller than in mellow fallow land, but at the same time less nitrogen is carried away by the waters and the greater portion of the nitrates formed are utilised by the plants. Furthermore, the nitrogen assimilated by the plants represents a gain. Besides, the useful bacterial and physicochemical phenomena produce more nitrogen than is produced by the opposite phenomena. It must be taken into account however that the nitrogen obtained by the plants from the subsoil comes from the agricultural soil. In any event, there is always an appreciable gain recorded above.

3. Organic substances, such as straw and sugar, reduce the assimilation of nitrogen by cultivated plants, even though put down in autumn. The differences observed for straw and sugar were not notably divergent from those produced by peat. It would appear to result from other experiments that with stable dung there is no gain of nitrogen, in so far as the latter can be produced by nitrogen-

forming phenomena, because the losses during the application of the dung and in the soil are higher than the production of nitrogen in the soil.

Finally, it should be noted that all these investigations were carried out on the basis of ploughing to a depth of 25 cm. (10 ins) and that the specimens were taken from the same depth.

44 C. T. GIMINGHAM. **The Formation of Calcium Carbonate in the Soil by Bacteria.** *The Journal of Agricultural Science*, Vol. IV, Part 2, pp. 145-149. Cambridge, October (November 11), 1911.

United Kingdom

The important part played by calcium carbonate in maintaining the fertility of the soil makes it of interest to investigate all the causes which determine both its formation and decomposition. One of the actions which tend to maintain its supply, is the oxidation by soil organisms of the calcium salts of organic acids, such as oxalic, which is formed in considerable quantities in plant tissues and by moulds and bacteria (1).

The writer attempted to isolate soil organisms responsible for this action. Various nutrient media were employed, and a large number of types of bacteria isolated and subcultured. None of them had the power of decomposing calcium oxalate. Better results, however were, obtained when a clear water extract of soil was used, the production of carbonate from the calcium oxalate added being more rapid in the case of a sandy soil, extremely poor in organic matter. The lack of much soluble organic matter seems to throw the organisms back on the oxalate for their supply of carbon.

Such cultures were purified by dilution, and eventually six types of bacteria were isolated possessing the power of forming carbonate.

The impure mixed culture consisting simply of unsterilised soil-extract was, however, on the whole more active in causing the fermentation of oxalate than any of the pure cultures.

The presence of oxygen is essential for the formation of carbonate. The writer found it impossible to get any action, either with mixed or with pure cultures, under anaerobic conditions.

In conclusion, it seems probable that more soil bacteria, than those isolated in these experiments are able to oxidise calcium oxalate, if driven to it by lack of other food.

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(1) HALL & MILLER, *Proc. Roy. Soc.* B. 77, 1905. (*Ed.*)

45 O. LOEW, (Ref.) R. EMMERICH, W. GRAF ZU LEIMINGEN. **The Injurious Action of Bacteria in the Soil. Soil Fatigue and its Remedies.** (Ueber schädliche Bakterientätigkeit im Boden und über Bodensäuberung). — *Centralblatt für Bakt.*, etc., II. Abt., Bd. 29, Nr. 23-25 pp. 668-683 + figs. 2 ; Bd. 31, Nr. 16-22, pp. 466-477, Jena, 8. April, 10. November 1911.

Germany

The Authors point out that the action of the micro-organisms in the soil may be beneficial or harmful as the case may be, to the growth of vegetation. Nevertheless the favorable action has always been studied and is already generally known, while little is known of the injurious effects which certain bacteria may cause under given circumstances, apart from micro-organisms which are really parasites, occasionally found in the soil. It must also be taken into account that it is not merely given species of bacteria which may cause injury to the root-systems of plants, but likewise an excessive accumulation of organisms generally, which chiefly happens when the ventilation of the soil is defective and rich organic manure causes a larger absorption of oxygen by the developing bacteria.

Keeping to the bacteria which may become specifically injurious, they may be divided into two categories ; reducing and fermenting bacteria. The former include the desulphating and denitrifying bacteria ; the latter the basic and acid bacteria.

As the Authors have observed, the desulphating bacteria are widely spread ; they are anaerobic forms which act by reducing sulphates to sulphuretted hydrogen, and which have been shown by the Authors to possess a toxic action in solutions of only 0.0042 %. Yet these bacteria can only exert harmful action when large quantities of gypsum are already present in the soil, or else when they are added, or again when they are produced indirectly by manure.

As to the denitrifying bacteria, which confine themselves to reducing the nitrates to nitrites, and subsequently to free nitrogen, they can only harm the vegetation when nitrate manure is given to very moist soils, as is already known, and the harm is less due to the loss of nitrogen than to the toxic action of the nitrites.

With respect to basic bacteria, that is, those causing an alkaline reaction of the soil, there are first the forms of the species *Proteus*, which bring about the putrefaction of albuminoids. These bacteria only become injurious when a poorly ventilated soil is heavily manured with organic substances of animal origin, which results in the formation of organic bases and also sulphuretted hydrogen, the action of which is toxic.

Among acid bacteria, finally, we have the butyric bacillus with its varieties, which, by the fermentation of the carbohydrates, leads to the formation of fatty acids and alcohols. The injurious action of these bacteria is particularly manifested in soils manured with excessive quantities of sugar, factory residues or fresh straw, or again where roots of plants rich in sugar or starch are rotting, and the deficiency of carbonate of lime prevents the rapid neutralisation of the acids produced by the development of these bacilli.

With this possible injurious action of the bacteria in the soil is connected the question of soil fatigue, that is to say, that the producing of a soil may fall off, even when it possesses or receives sufficient quantities of fertilising substances.

It has been sought to overcome this fatigue by disinfecting the soils, whether the originating causes were vegetable or animal, parasitic or non-parasitic. With this object, the use has already been proposed of carbon disulphide, benzol, toluol, the cresols, phenol, formalin, permanganate of potash, etc., and latterly carbolineum, proposed by Hiltner. Carbolineum seems to have several advantages over the other disinfectants; it is not inflammable like carbon disulphide, it is far less expensive than benzol, toluol, the cresols or phenol : its action is not too prolonged like that of formalin; it has a more general action than permanganate ; and at the same time its action is no less effective. The only condition is that it should be applied 2 to 4 months before sowing, so that its volatile components should not be able to injure the seedlings.

In this connection the Authors agree with Hiltner in pointing out that there is one case of fatigue which cannot be remedied by disinfectants : this would be the case of soil which had grown too acid in consequence of a mistaken application of manure, and where the quantity of carbonate of lime present was too small. Peas are said to be particularly sensitive to this, as shown by the observations of Dr. S. Hori, of the Tokio Experimental Station; in that case an application of lime or ash will be found affective.

There must further be considered in the soil the Protozoa, the general presence of which was first recorded by Hiltner. Hall then put forward the theory that these protozoa destroy the nitrifying bacteria, whence the useful effct observed of heating the soil, or treating it with carbon disulphide, according to the investigations of Hall himself and Russell and Hutchison (1) ; the latter also referred to the fertilising action of the protozoa thus killed. The Authors nevertheless hold that although this theory may correspond to the truth in many cases, it is impossible to generalise it, because the favourable action observed must often be connected with the destruction of the parasitic and semi-parasitic Nematodes.

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(1) Cf. *The Science and Practice of Farming during 1910 in Great Britain*, pp. 187-189. (*Ed.*).

The Authors likewise found another disinfectant for the soil in the shape of chloride of lime, and one which may be highly advantageous in some cases; as it is rapidly transformed in the soil, cultivation may be begun from 10 to 12 days after its application. They carried out, themselves or through others, various comparative experiments with lime, chloride of lime, permanganate of potash, carbon disulphide, carbolineum and tricresol, treating beds in three gardens and a kitchen garden in various parts of Bavaria, and cane-sugar plantations in Porto Rico (1).

From all these enquiries and observations the following important practical conclusions may be drawn ;

1. To restore fertility to fatigued soil, that is, as a means for disinfecting or rendering healthy an infected soil, carbolineum occupies the leading place.

2. According to the soil and the infection, it should be put down in the proportion of 50 to 150 cc. per sq. metre (1 ½-4 ½ fluid ozs per sq. yd).

8. Chloride of lime may often be used advantageously, but never in doses of less than 300 grams per sq. metre (9 ozs. per sq. yd.).

46

A. Koch and C. Hoffman. **Diversity of Temperature required or the Development of Thermophilous Bacteria in the Soil and in Nutritive Media.** (Ueber die Verschiedenheit der Temperaturansprüche thermophiler Bakterien im Boden und in künstlichen Nährsubstraten. Aus dem landw.-bakt. Institut der Univ. Göttingen). — *Centralblatt für Bakteriologie*, etc., II. Abt. 3 Bd. 31, No. 16/22, pp. 433-436. Jena, 10. November 1911.

Germany

It has already been observed that bacteria, above all nitrifying bacteria, behave differently in moderately moist soils and in artificial culture media, and, in particular, in solutions. M. Koch had likewise already demonstrated that denitrification of the soil takes place in an entirely different way in the soil (with formation of albumen) than in nutritive solutions (with separation of nitrogen) nevertheless, this latter also takes place in the soil when it is very moist. The Authors therefore thought that there was some relation between this observation and the fact of the presence of thermophilous bacteria in the soil, because these bacteria develop in nutritive soils at temperatures exceeding 40-50° C., which it is difficult to find in the soils of temperate climates.

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(1) See *Bull.* Dec. 1910, p. 218. (*Ed.*).

As a matter of fact, in the present enquiries two forms of bacteria were isolated from loamy soil; whereas these bacteria only developed in nutritive solutions at 52° C., they develop in the soil at 28° to 30° C. It may be concluded from this that the temperature requirements of thermophilous soil bacteria may be substantially modified by the nature of the environment.

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION.

47 HALTON THOMSON. **Flood Prevention in Silesia.** — *The Times (Engineering Supplement)*, No. 349, p. 23. London, Nov. 1, 1911.

rmany

From time immemorial the valleys of Western Silesia and the adjacent regions have been periodically devastated by floods, but until recent years the measures taken to moderate their destructiveness have had little practical effect.

The province of Silesia is drained almost entirely by the river Oder, which runs across it in a north-westerly direction.

After numerous floods it became obvious that no system of river-dredging alone would be sufficient to carry off the floods, but that a series of reservoirs formed by dams to hold them back was necessary.

Near the head of the Queis there is a reservoir of 750 million gallons for the protection of the town of Friedberg, and lower down, above Marklissa, another holding 3 300 million gallons.

Situated on the other principal left-bank tributaries of the Oder in Silesia there are five reservoirs ranging from 500 to 110 million gallons in capacity.

The biggest work is the construction of the Maner dam at a gorge where the Bober drains an area of 300 000 acres,

The work is approaching completion, and will be brought into use next year.

The other big piece of construction is the Marklissa dam on the Queis, which was completed in 1901. The reservoir contains 3 300 million gallons when full, of which 1 100 million gallons are stored for power purposes.

The drainage area is 75 000 acres. In addition to the constructions of dams, an extensive dredging of the river channels has been taken in hand; it will, however, be obvious that this portion of the work could be considerably reduced where the rate of discharge is equalised and diminished by the action of the reservoirs.

48

BURGE. **Irrigation in New South Wales.** — *The Times* (Engineering Supplement). No. 348. Page 23. London, October 25, 1911.

Australia: N. S. Wales

The construction of the Burrinjuck irrigation dam, which rivals in size and in quantity of water impounded the Assuan Barrage, and the lofty dams in the arid West of the United States, is already far advanced. No irrigation, however, was required in the neighbourhood of the dam, as the river flows thence through fertile undulating country with a sufficient rainfall for ever 200 miles. Then the river begins its sluggish career of some 300 miles across the dry western plains, portions of which it is proposed to irrigate, so that, as in the Assuan scheme, the dam merely regulates the supply of water — it does not divert it.

Down to the plains, the Murrumbidgee, like most rivers, adds to its drainage and volume as it proceeds, an important affluent being the Tumut River, which some time later may also be conserved in its upper reaches. But the main river after its *débouchure* on the flat country, like other Australian rivers, actually diminishes in volume during its course, and is only a comparatively small stream at all seasons where it flows into the Murray River. The cause of this is the spreading out of these rivers into wide shallow lagoons, where evaporation under the fierce western sun, and percolation, dispose of a large quantity of their valuable waters. Hence the necessity for irrigation purposes, of, so to say, catching the rivers young, and disciplining them in narrow artificial channels, when they reach localities favourable to wasteful dispersion. When the reservoir is full — viz. to 10 ft. below crest — the storage will amount to about 33 000 million cub. ft., or a greater amount than is contained in Sydney Harbour, and it will form a lake of 20 square miles in extent. The river will be backed up for 41 miles, and the Goodradigbee and Jass rivers, which are tributaries close to and above the dam, for 15 and 25 miles respectively.

The cost amounts to about £ 1 per acre-foot of water impounded, which, with the exception of the Roosewelt dam in Arizona, is stated to be much less than that of any other of the great dams of the world.

49 **The Djerid Canal.** (Canal du Djerid). — *Société de Géographie Commerciale de Paris*, T. XXXIII, No. 10, pp. 662-666. Paris, Octobre 1911.

Tunis

With a wiew to the development of Southern Tunis, so richly endowed by nature, yet so wretchedly poor at the present time for want of a good watering system, the chotts (salt-marshes) might be brought into communication with the Mediterranean near Oudref, through the Melak oued.

The canal thus proposed would be of considerable agricultural interest, and of great commercial utility if wide and deep enough to allow sea-going ships to take in at El-Oudiane cargoes of phosphates, manganese ore and the produce of the salt mines abounding in the region.

The following are the essential steps:

1. To improve the locality by thorough drainage and thus restore to cultivation the greater part of the land at present occupied by the chotts.
2. To complete the previous work by damming the oueds (ancient water-courses) so as to enable the region to be rationally irrigated and the floods and rises methodically turned to account.
3. To give the channel a depth of 6 metres (20 ft.) in order to make it navigable and to keep it in constant communication with the sea, thus preventing it from drying up during summer. This canal would become a real harbour for Oudref and even Gabes.

When once the canal was constructed between the sea and the end of the chott (which involves a wide cutting through a dune 30 metres (100 ft) high, and perhaps constructing a canal apron of masonry along this channel) care must be taken to continue the route through the chott, if only by means of stakes, as was done in the roadstead of Toulon between Tamaris and Sablettes ; and as was done on a larger scale in the Tunis lake. The fact must not be lost sight of that the chotts at times receive considerable volumes of water when storms convert the oueds into furious torrents. Hence the necessity of not imprisoning the proposed canal between rigid banks, which would soon be destroyed.

The port of Tozeur (or El-Oudiane) should be designed on the same principales as that of Tunis, making use of the existing lake, the outline of which would be made more regular.

Furthermore provision must be made for the contingency of continuing the canal as far as the Tozeur Isthmus beyond El-Oudiane and El-Hamma, and it would perhaps be necessary at this point to establish a lock, because the map shows a great difference of level between the Djerid chott and the El-Gharsa chott, which is said to be 31 metres (101.7 ft.) below the level of the sea.

If the execution of this first scheme gave good results, the following chotts could be connected with each other ; the Gharsa-Medjid and Merouan, thus joining up the Rihr-oued and the region of Touggourt. The second system, it would seem, ought to be very interesting from the point of view of agriculture and irrigation and perhaps even navigation.

Technical Difficulties. A dune 30 metres (100 ft.) high rises between Oudref and the chotts; this is the only serious obstacle. Theoretically, the best way out of the difficulty would be to dig the canal starting from the sea, installing a floating dredger which would excavate its own way through the chotts. The sea water would convert the sand into liquid mud and the work would be made easy. This would obviate the drawback of having the canal dried by the intense absorption which will take place when sand is for the first time brought into contact with the water.

A second difficulty lies in the difference of level ; this can be remedied by means of locks

There must also be provided at certain points reservoirs with submersible banks, for the discharge of the water when it reaches abnormal levels. The opposite occurance need not give rise to apprehension, because if the level of the chotts in summer sinks by evaporation below the sea level, a reverse current from. Oudref to Tozeur will form, which need not be objected to in any way. The Achkeul lake in winter empties into that of Bizerta, through the Tindja oued ; while in the summer on the contrary the Bizerta lake supplies the Achkeul with what the latter loses by evaporation.

Financial means. To cover the cost of the undertaking, several combinations are possible.

1. If the State undertakes the matter, it need only appropriate in the budget the expenses for the first canal between the sea and the Tedjedj chott, through Oudred, and reserve the right of conceding, in return for royalties, the lands made serviceable by the drainage of part of the chott.

2. If the State does not desire to make this first expenditure, it can:

a) Give the concession of the canal in question to a special company, which would be entrusted with keeping the channel navigable and would levy certain dues.

b) Concede to a Company part of the lands developed, subject to excavating and maintaining the different irrigation canals.

c) Bring about the formation of agricultural irrigation syndicates which would supply water to their members on payment.

The Author dwells on the idea of a canal in order to make it perfectly clear that there is no question of an inland sea (the old scheme of Colonel Roudaire), with vague and changing boundaries. Quite the contrary, the chott marshes must be replaced by a well demarcated and regular water course; in short, they must be converted into a canal.

Irrigation Schemes in German East Africa. (Wasserwirtschaftliche Vorarbeiten in Deutsch-Ost Afrika). — *Deutsches Kolonialblatt*. Nr. 23. pp. 901-902. Berlin, 1. Dez. 1911.

The importance of the irrigation scheme for the steppe of Mkatta, in the region of the rivers Wami, Kissagata, Talme in German East Africa, is great. The physical and chemical conditions of this steppe are exceedingly well adapted to irrigation, and the canals may easily perform useful watering functions owing to the slope of the soil. The area to be irrigated under the scheme would be 7 600 hectares (16 700 acres).

Another scheme on the other hand studies irrigation by damming the waters, which now sometimes flood the steppe.

The third scheme aims at the reclamation of the Kilosssa marsh.

The Commission appointed for this purpose will take as its basis the irrigation experience already gained in Algeria and Egypt, in order to adapt the results to the conditions of the German colonies, while allowing for the special difficulties which may arise in these colonies.

E. DISERENS. **Land Improvements in Canton Vaud, Switzerland.** (Les Améliorations foncières dans le canton de Vaud). — *Annuaire agricole de la Suisse*, 12e année, 4e fascicule, pp. 279-291. Berne, 1911.

The permanent improvement of land must be considered one of the most important factors in the development of Swiss agriculture. The federal law of 1884 gave a great impetus to such improvements, in that it provided for federal financial aid for them, on condition that the cantons did likewise.

In 1890, the department of agriculture of Canton Vaud gave notice that subsidies would be allowed by the Confederation and the Canton for drainage, irrigation, warping, clearing, straightening of streams, construction of railways, joining up of fields, securing of water supply, building of chalets and shelters in the mountains, etc.

From 1891 to 1909 the following undertakings were subsidised:

A. Improvements in the valleys (drainage, canal-construction, construction of occupation roads), 112, estimated at 2 167 692 fr., (£ 86 707) subsidies 1 052 943 fr. (£ 42 117).

B. Improvements in the mountains (roads, water-leads, chalets, etc.), 115, estimates 1 825 792 fr.. (£ 73 031); subsidies 812 178 fr. (£ 32 487).

Total, 227 undertakings, estimates 3 993 484 fr. (£ 159 739) subsidies 1 865 121 fr. (£ 74 604).

During the last year, 54 undertakings were under way, with a total cost of 1 601 834 fr. (£ 64 073) Further, 52 projects are estimated at 2 180 000 fr. (£87 200) This increase is largely due to the cantonal law of May 21, 1907, on land improvements.

This law has adopted the principle of the compulsion of minorities; it also provides facilities for exchanges of property and transference of mortgages.

Subsidies are only granted to communes or syndicates of proprietors. A syndicate must be composed of the majority of the landowners; but this majority may be reckoned *either* by the number of the individuals *or* by the area they own · consequently, on the one hand the opposition of a few large proprietors may be overcome, and on the other hand a majority of small owners cannot block a scheme. The obligation for the minority to join in a common scheme is announced in a decree of the Conseil d'État, after consideration of the value of the improvement, the plans prepared, the boundaries, and the distribution of the cost.

To reduce general expenses, the State arranges for the elaboration and execution of the work to be under one management.

A. *Improvements in the Valleys.*

1. Drainage and redivision of fields at St. Gierges. — This comprised the improvement of 40 ha. (99 acres) belonging to 38 owners. The estimate was 44 000 fr. (£1742,10 *s.*) and the actual expense 100 fr. (£4) less. In the redivision, 142 fields were reduced to 66, at a cost of 4 900 fr. (£194).

2. Drainage and redivision of fields at Bretigny sur Morens. — An area of 44 ha. (109 acres) was drained, provided with roads, and divided into regular fields easy to cultivate. The net return was 112 fr. per ha. (£1.16 *s.* per ac,), representing 21.4 % of the capital employed.

At Bretigny a course of instruction in draining was held, with the object of training local men to be specialists in the delicate operations of draining,—preparing the bottoms of the trenches and laying the pipes. Out of 100 candidates, 40 were chosen and divided into four classes, each under a foreman, for practical work. These trained men are employed as drainage foremen; others do work for private individuals.

B. *Improvements in the Mountains.*

The value of the pastures, chalets, sheds, water-leads, paths, and forests of the Alps in Canton Vaud is 22 400 000 fr. (£887 000). The animals driven up to the pastures for three months in summer number 31 700.

Numerous paths have been constructed in the Alps and the Jura to facilitate the utilization of the grazing grounds and forests. Draining has been carried out in the Enhaut district and is in progress on a great deal of the damp pasture-land resting on the *flysch* (impervions deposits of clay or sand). There is also a scheme for new pastures on the plateau of Les Chaux, with improvements of the existing ones.

The estimate for all these improvements comes to 105 000 fr. (£4 160).

C. *Regulation of River Courses and Drainage.*

Considerable sums have been allotted to the drainage of the marshes by the Orbe, and to the regulation of the Broye and the Rhone. Embankment, consolidation of the banks; and particularly deepening, will be undertaken. This will allow of improvement of the adjoining land, whose letting value will thus be increased.

D. *Farm Buildings.*

Much economy in cost of buildings is effected by judicious choice of materials.

For holdings of moderate size, barns with side stages for unloading are found very convenient.

TILLAGE AND METHODS OF CULTIVATION.

BERSCH. **Cultivation of Peat Moors in Austria.** (Die Aufgaben der Moorkultur in Oesterreich). *Monatshefte für Landwirtschaft,* 12 Heft, Seite 353-360. Wien, Dezember 1911. **52**

Austria

In Germany, thanks above all to the Bremen Experimental Station, cultivation on peat moors has undergone great development and thrives on a large scale. A central Commission was also appointed with the object of rendering the peat moors of Prussia productive. In Germany, moor lands might still feed 8,000,000 qls. (8 000 tons) more live weight of cattle and 70 000 more peasant families.

But, while in Germany peat moors are uniform in character, those of Austria vary with geographical changes, for instance the steppe moors of Galicia and those of the South, on the Alps, are 1000 metres (3300 ft.) above sea level. For this reason the measures adopted by Austria for working its boggy soils cannot be uniform. The entire secret of cultivation on Austrian peat moors lies in the system best adapted for getting rid of the water.

The area of peat moors in the Alpine regions of Austria is 26 574 ha. (65 665 ac.), divided as follows:

Regions	Number of Moors	Area		Altitude	
		ha.	ac.	metres	ft.
Lower Austria . . .	199	3 378	8 347	184-1032	604-3 490
Upper Austria . . .	199	3 160	7 808	420-1598	1 380-5 243
Styria	86	2 267	5 602	629-1523	2 066-5 002
Carinthia	130	4 184	10 339	420-1463	1 380-4 804
Carniola	6	10 243	25 311	288-1200	946-3 940
Tyrol	105	2 280	5 633	209-2100	687-6 900
Moravia	140	1 059	2 617	209-1278	687-4 200

To this area, in adddition to the peat moor soils of Bosnia, there must be added 300 000 ha. (750 000 ac.) of peat moor in Galicia.

Returning to Alpine countries, to which must be added Salzburg and Vorarlberg with 8000 ha. (20,000 ac.) of peat soil, we have a total of about 33 000 ha. (82 000 ac.). Estimating the produce at 70 qls.

D. ZOLLA. **Cereal Cultivation for Dry Soil.** (La culture des Céréales en terres sèches). — *Revue générale des Sciences pures et appliquées,* 22e année, No. 22, pp. 880-885. Paris, 30 Novembre 1911.

In discussing the method of cereal cultivation carried on by M. Bourdiol in Algeria (1), *i.e.* a modified dry-farming method combined with a modified Lois-Weedon method, the writer calls attention to the fact that no deep ploughing is required. He also describes the experiments by Müntz and Lainé on the absorption of soil-moisture by seeds (2). In experiments on wheat grains it was found that with an unlimited supply of water, the amount required for germination was absorbed in one day.

In soil, on the other hand, the seed may have difficulty in obtaining its water-supply, and in some cases cannot obtain enough for germination. In a garden soil containing 2.36 % of moisture, the seed could not obtain the necessary amount (45 gm. each); but with 13.59 % of moisture, the necessary amount was absorbed in 48 hours.

Clay and humus have to be very moist before they will give up the required amount.

In an experiment with wheat in soils containing varying proportions of clay and moisture, it was found that germination took place in the one containing least clay with only 2.5 % of moisture; in one containing more clay with 4 % of moisture; and in a strong clay with 7.7 % of moisture.

In another case a sandy soil, with saturation capacity of 1, allowed germination to proceed in the presence of only 5 % of moisture; whereas in a clay, with saturation about 20, nearly 19 % of moisture was required.

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(1) See *Bull.* Dec. 1910, pp. 234-235.

(2) See *C. R. de l'Académie des Sciences de Paris,* 7 Novembre 1910. (*Ed*).

MANURES AND MANURING.

56

Müntz and Lainé. **Study of Sewage Water with a view to its Purification and Agricultural Use** (1). (Etudes sur les eaux d'égout, au point de vue de leur épuration et de leur utilisation agricole). — *Bulletin de la Société d'Encouragement pour l'Industrie Nationale,* III^e année, T. 116, No. 8, pp. 133-166. Paris, Octobre 1911.

France

The experimenters carried out a very large number of experiments to ascertain the nature of the more or less complex phenomena which take place in the course of the purification of sewage water by bacterial beds and agricultural soils. They studied the following phenomena:

1. Loss of nitrogen in purifying sewage water by bacterial beds.
2. Loss of nitrogen in spreading sewage water over agricultural land.
3. Causes of loss in the course of purifying sewage water.
4. Reduction of the nitrates in the absence of oxygen.

The authors also enquired into the agricultural value of sewage water, the latter being considered both as irrigation and as fertilising factors.

Use of Sewage Water for Farming Purposes.

On hygienic grounds, the waste water produced by the aggregation of human beings in cities must be discharged as soon as it is produced. For this purpose three processes are available:

The first consists in emptying the sewage directly into streams. This process is bad, as it pollutes the water and disseminates contagious disease organisms.

The second consists in the purification of the waste water by agricultural land.

The third consists in preparing bacterial beds, where purification similar to that of agricultural land is carried out, but with greater intensity. The bacterial beds are highly aerated, and the nitrifying organisms are accompanied by the ordinary agents of combustion, such as moulds, which break up the organic matter and reduce the nitrogen to the gaseous state. As a result, the losses of nitrogen on bacterial beds are considerable; these losses amount to 60 and 70 % of the total nitrogen, and are greater in proportion as the waste waters are richer in organic substances.

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(1) See *Bull.* April 1911, No. 1140; May 1911, No. 1376; and July 1911, No. 2079. (*Ed.*).

In agricultural soils where nitrifying organisms predominate, the losses are *nil*, or very small, and the conversion of ammoniacal nitrogen into nitrates is almost complete.

One or other of the two last-named processes must be adopted, the choice depending on circumstances; but the one which consists in spreading the sewage on the land is far preferable, because it has the double advantage of more perfect purification and considerable economic results.

Sewage may be regarded as an irrigation water which carries with it fertilising elements, and the expense which had been and is being borne every day for irrigating soils by ordinary water may, *a fortiori*, be incurred for sewage water, because the latter, in addition to its irrigation value proper, has another and a far greater value as manure. It may be economically conveyed to a distance from towns and spread over sufficient areas, which can utilise them while purifying them.

The average composition per cubic metre of the sewage waters in the main on the left bank of the city of Paris is as follows:

	Grammes
Ammoniacal nitrogen	21.61
Organic nitrogen in solution	7.66
» » in suspension	25.85
Nitric nitrogen	0.73
Total	55.85
Phosphoric acid	12.00
Potash	45.95
Lime	377.00
Magnesia	104.4

If we allot to these elements the average prices they fetch in manures, a cubic metre of water would, from the point of view of its content of fertilising elements, have the following value:

	Fr. c.
For the nitrogen	0, 084
» phosphoric acid	0, 003
» potash	0, 018
	0, 105

Regarded exclusively as irrigating water, its value, as compared with that at which the Irrigation Companies generally sell water for farming purposes, at the rate of 40 francs per 16 000 cubic metres, would represent 0.0025 francs.

If irrigation water is worth 0.0025 fr., sewage water will be worth 0.1075 fr. *i. e.* 43 times as much.

Distribution of the Fertilising Elements retained in the Soil.

If the soil is not covered with vegetation, the nitrified nitrogen is not retained and passes into the drainage water; only the inorganic nitrogen of the substances in suspension is mechanically fixed. The potash and phosphoric acid are kept back almost in their entirety.

If the soil is covered with vegetation, the soluble nitrogen is fixed for the greater part, and in this case almost the whole of the nitrogen in sewage water will be retained if the water is not supplied in excess.

The experimenters carried out irrigation on bare land for seven months; the results, calculated per acre, were as follows:

	Quantities		
	Spread lb.	Carried away lb.	Fixed lb.
Nitrogen	1199.7	904.6	105.1
Phosphoric acid	254.8	2.7	252.1
Potash	987.9	172.8	815.1
Lime	8102.8	4353.9	3749.0
Magnésia	2244.7	151.2	2093.5

Analyses carried out at several depths to ascertain the distribution of the fertilising elements retained, yielded the following results.

		Per 1000 of dry earth	Per 1000 of fine earth			
		Nitrogen	Phosp. ac.	Potash	Lime	Magn.
Soil before irrigation		1.239	0.93	1.83	21.98	1.42
Soil after irrigation	surface soil	1.888	1.29	2.39	26.72	2.01
	subsoil	1.210	0.91	2.22	22.48	1.94

It will be seen that the subsoil has grown poorer in nitrogen owing to nitrification. The surface soil on the contrary has been enriched by the accumulation of organic substances which the sewage water held in suspension. These organic substances withstood the action of the micro-organisms, and formed at the surface a sort of felt-like impermeable ooze.

In the same way the phosphoric acid retained was exclusively localised in the superficial coating.

In irrigating by means of sewage water, therefore, care must be taken, by ploughing, to incorporate these superficial deposits with the soil, as they would end by forming an impermeable layer unsuited for cultivation, while the subsoil would tend to grow poorer.'

A part of the potash, the lime and the magnesia is also kept back at the surface, but another portion, originally in the soluble state, reaches the deeper parts, where it is retained by the absorbent power of the earth ; a third part escapes this absorbent power and is discharged in the drainage water.

The above figures cannot all be generalised owing to the divergence in the constitution of soils. The soil on which the writers operated was light and possessed poor absorbing power.

Quantities of Sewage Water useful for Irrigation.

If sewage water be regarded exclusively as a manure, it is easy to calculate the quantities which would need to be distributed to the principal crops.

Thus, heavily manured grass land receives:

357 lb. per acre of superphosphate, *i. e.* 53.5 lb. phosph.acid
268 lb of nitrate of soda, *i e.* 38 lb. nitrogen
178.5 lb. of potassium chloride . . . *i. e.* 93.7 lb. potash

The volume of sewage water required to furnish these quantities of fertilising substances would be:

7 350 cub. ft for phosphoric acid
1 175 » for nitrogen
3 380 » for potash.

It may therefore be said that an allocation of 7 350 cub. ft. per acre distributed in 10 irrigations during the vegetative period, suffices to ensure an intensive vegetation, both from the point of view of the fertilising substances and from that of the water used for irrigation. Furthermore, it supplies the nitrogen and potash required as plant food.

If we consider the cultivation of wheat, for which there are usually given per acre:

178 lb. of nitrate of soda, or . . . . 25.7 lb. of nitrogen
268 lb. of superphosphate, or. . . . . 40 lb. phosph. acid

we see that 750 to 850 cubic feet of sewage water would suffice to supply the nitrogen, but nearly 6 000 would be wanted to supply the phosphoric acid. It is, however, impossible to give wheat this latter quantity of water, because 2 or 3 waterings in the course of the cultivation year are sufficient even in dry regions. It is therefore logical to adopt the lower figure, and to make up the deficiency by an additional dose of superphosphate.

If instead of considering an isolated crop we consider the three-year rotation, potatoes, wheat, oats, with 16 tons of farm manure and 2 ½ cwt. of superphosphate at the start of the rotation in the first year, ½ cwt. of nitrate as a top dressing on the wheat in the second year, and 2 ½ cwt. of superphosphate and ³/₄ cwt. of nitrate of soda in the third year on the oats, there will have been given:

	lb.
Nitrogen	204
Phosphoric acid	222
Potash	284

The quantities of sewage water corresponding to the same proportions of fertilising substances are:

6 000	cub. ft.	for	nitrogen	i. e.	2 000	cub. ft.	per year
30 000	»	»	phosph. acid	»	10 000	»	»
10 000	»	»	potash	»	3 400	»	»

It will be seen from these last figures that sewage water is not a well balanced manure and that it cannot be regarded as a complete one. It must be considered especially as a nitrogenous manure, and the quantities required to supply the nitrogen needed must be given, and the known deficiency made up by chemical fertilisers.

This leads to the conclusion that if the application of chemical manures and sewage water is combined, there must be used:

On natural grass land	1 200	cub. ft.	of sewage water
For wheat	750 to 850	»	»
For a three-year rotation, per year	2 000	»	»

Calculations of this kind may be made for all crops, but we shall be led to regard forage cultivation as best suited for utilising sewage water from the two-fold point of view of the contribution of fertilising substances and the distribution as irrigation water.

For sewage water, however, it is impossible to proceed as with irrigation water; it must be used in winter, even should its fertilising activity not be able to develop fully, and the nitrogen contained be carried away by the drainage waters.

It follows therefore that the foregoing calculated quantities are insufficient; they must in reality be doubled or trebled; which gives;

3 700 to 4 400 cub ft. for natural grass lands
2 200 to 2 650 » for wheat
6 600 to 7 350 » for the three-year rotation.

At the present time the fields used in the vicinity of towns for purifying sewage waters receive quantities of water 10 to 15 times in excess of what would be needed for good fertilising and irrigation.

Therefore surfaces 10 or 15 times larger than those adopted are needed, and together with the agricultural utilisation of the sewage water, its purification would be effected in the completest way.

It may be asked whether the sewage waters of Marseilles, instead of being emptied into the sea, could not have been used for watering the "Cran" and whether they would not have given that abandoned region great agricultural wealth. It may likewise be considered how greatly a territory like that of Beauce would be benefited if the sewage waters of Paris could be spread on it, thus converting it into rich land for growing forage crops.

87 J. W LEATHER & JATINDRA NATH MUKERJI. **The Indian Saltpetre Industry.** — *Agricultural Research Institute, Pusa, Bull.* No. 24, pp. 19 + pl. VIII. Calcutta, 1911.

British India

The Indian production of potassium nitrate is a small part of the world's production of nitrogenous products. The stability, however, of the market price, and also the fact that Germany manufactures considerable quantities of potassium nitrate would tend to establish that there is a real demand for potassium nitrate or saltpetre.

According to the writer the production of saltpetre in India dates from very early times. The industry has suffered some fluctuations. Fifty or sixty years ago the average export from Calcutta amounted to over 30,000 tons, but has usually averaged about 20,000 for a long period. It seems, however, that there is some indication that the average outturn is slowly declining, though the decrease is not large.

The following statement illustrates these points:

	Average annual export Tons	Average price per cwt Rs. a.	
1894-98	20 400	11 0	(14*s.* 8*d.*)
1902-06	18 400	10 6	(13*s.* 10*d.*)
1907-10	18 400	11 4	(15*s.*)

The Indian industry of saltpetre depends for its raw material on earth which is collected from old, as also from existing, village sites, which are found only in certain localities. Such earth is scraped together in small quantities by a very poor caste called « Nunia », who extract from it the crude saltpetre. This earth contains very varying amounts of nitrate, from 1 per cent. up to 29 per cent.; but it does not contain generally more than 3 to 5 per cent. In addition to the nitrate, the earth always contains some percentage of chloride and sulphate. The percolating process employed in the extraction is as efficient as it is economical. The strong liquor thus obtained is boiled down in a pan, or it is allowed to concentrate in a tray in the sun. As these liquors concentrate, they first deposit common salt, and then the saltpetre is allowed to crystallise out. The mixture of common salt and saltpetre is separated from the mother liquor, and sold as crude saltpetre to the refiner. The composition of this crude saltpetre varies a good deal:

Potassium nitrate. . .	from	26.86	to	68.40
Calcium » .		0.00	»	3.28
Magnesium » .		0.00	»	12.24
Sodium chloride. .		16.82	»	35.38
» sulphate .		3.40	»	14.60
Insoluble matter. .		0.90	»	1.70
Water		3.70	»	13.50

The mother liquor is thrown on the factory earth, which is eventually broken up, air-dried and again extracted. In fact the process seems to be a never-ending one, notwithstanding that there is at every factory a constant addition of some fresh earth. One explanation, as put forward by the writer,* would be that assimilation of atmospheric nitrogen goes on, coupled with nitrification, but that these processes are so limited in intensity that outside additions of nitre earth are also necessary. It is a case which deserves a careful bacteriological study. No doubt the nitrates, which the earth originally contains, are formed from organic waste materials, urine, dung and vegetable debris, but our knowledge does not go further than this.

The refining processes of the crude saltpetre are several in number, but they may be sketched thus.

In the principal process the crude saltpetre is added to a boiling hot mother liquor from a previous operation. Such liquor is saturated with common salt and sodium sulphate, consequently when the crude saltpetre is added to it, the potassium and other nitrates are dissolved, but the sodium chloride and sulphate and the dirt remain undissolved. The fire is removed and the insoluble matters quickly subside. The hot clear liquid is run into wooden vats where it is allowed to cool, and a good deal of the potassium nitrates crystallises out, The crystallised potassium is then taken out, drained from the liquor, often washed slightly with water, and is ready for the market.

The insoluble matters and other waste products form the refinery earth. There is a generally accepted notion that nitrification occurs in it, but without a very definite evidence. However, this earth is gradually worked, and the strong liquor extracted is dealt with in two differents ways. In one of these it is boiled in iron pans, and as the water evaporates common salt is precipitated. This salt is taken out, and the solution allowed to cool, when potassium nitrate crystallises out This refined saltpetre is not very pure. In the other way the strong liquor is heated with fresh insoluble matters, the clear hot liquid is separated and boiled down, and the common salt is precipitated and taken out. To the hot liquor now obtained is added some mother liquor from the crystallizing vats and crude saltpetre. The mixture is boiled for a few minutes, the liquor is separated and allowed to crystallise slowly as in the principal process.

The refined saltpetre is usually fairly pure as the following statement exemplifies:

		%		
Potassium nitrate . . .	from	82.61	to	92.98
» chloride . .	»	0.00	»	3.54
Sodium sulphate . . .	»	0.00	»	0.61
» chloride . . .	»	0.61	»	3 64

The result of the washing is the production of a saltpetre of higher purity, up to 94.70 per cent.

In conclusion, the «Nunia» work very economically, and their process is the best that could be devised.

But the present processes of refining are wasteful, and cause also a large consumption of fuel; they are much hindered during the monsoon period; and the colour of the refined saltpetre is brown and it has to be washed.

The writer would therefore suggest the following improved method of refining: 1) the crude saltpetre is heated to nearly the boiling point with the mother liquor in a digester; 2) the hot mixture of potassium nitrate solution and undissolved matters is run into a filter which is kept hot, and closed, and air is pumped in; 3) the hot liquid from the filter is run into a cooler, by this means the refined saltpetre is precipitated as a mass of small crystals of very fair purity; 4) the cooled mixture of saltpetre crystals, and the mother liquor is run into a centrifugal machine; 5) after the mother liquor has run out of the centrifugal, a small quantity of cold water is syringed on to the dry and white saltpetre to remove most of the chlorides.

The purity of this product rises to 93 or 94 per cent. The insoluble matters are returned to the digester and again extracted. The amount of nitrate obtained from this second extraction is naturally less than from the first. A third extraction does not pay.

A complete apparatus for refining about 30 maunds (2469.15 lbs) of crude sulphate per day will cost about R. 3000 (£ 200.).

It must be added that common salt is a bye-product of the ordinary or native process of refining.

GEORGES CLAUDE. **On the Manufacture of Pure Nitrogen.** (Sur la fabrication de l'azote pur). — *C. R. Ac. des Sciences*, T. 153, No. 17, pp. 764-766. Paris 23 Octobre, 1911. **58**

France. Italy. Sweden

The cyanamide industry demands great quantities of nitrogen of a purity of 99.6 and even 99.75 per cent., failing which, among other disadvantages, the carbon electrodes of cyanamide furnaces rapidly burn away.

Up to date factories with an annual capacity of output not far below 100 000 tons, succeed in fixing up to 400 kilogrammes of nitrogen per H. P. per annum.

Chemical processes having proved unequal to the task both from the point of view of capacity of production and from that of cheapness, assistance had to be sought from the liquid-air industry. The condition as to the purity of nitrogen, *i. e.* that it should not contain more than 0.25 % of oxygen, seems however impossible of fulfilment to liquid air experts.

A process invented as far back as 1903 by Professor Linde and by R. Levy, and perfected later by Linde himself, yielded remarkable results, which justified its immediate use in a large number of works.

After the evaporation of liquid oxygen, by causing the remaining nitrogen to pass through a washing liquid containing only 4/5 of the total oxygen of liquid air, a nitrogen containing only 7 % of oxygen had been obtained. By an extremely ingenious device, by heating this impure nitrogen in exchangers and subjecting it to another compression at 4 or 5 atmospheres, then drying and cooling it before liquefying it once more, a 7 % washing liquid is obtained ; after which, sucessively and more easily, washing liquids less and less rich in oxygen are secured, which enable nitrogen approaching absolute purity to be produced.

This method is based on the property of these washing liquids of absorbing the oxygen of which they are in need, which property M. Georges Claude had pointed out in a more simple process, but which only allowed of obtaining nitrogen with 2 or 3 % of oxygen.

After numerous experiments, by liquefying the residual nitrogen by means of liquids circulating in the base of the rectifying column, he has succeded in producing in the required abundant quantity a washing liquid containing only 0.4 % of oxygen. The nitrogen obtained by this new method contains only 0.2 % of oxygen.

Two plants, the first of this kind, are at present in operation in the works of the " Societa Italiana per il carburo di calcio " at Terni, where each of them, with a power of 125 H. P., supplies 400 cubic metres of nitrogen of 99.7 per cent purity per hour. Two other plants of 500 cubic metres of 99.8 per cent per hour, the most powerful at present existing, are in process of erection at the Alby Works of the " Alby Carbidfabriks Aktiebolag " in Sweden.

59 S. S. PECK. **Nitric Nitrogen in Mixed Fertilizers.** — *The Journal of Industrial and Engineering Chemistry*, Vol. 3, No. 11, pp. 817-818. Easton, Pa., November, 1911.

An investigation bearing on the loss of nitric nitrogen in mixed fertilisers, as suggested by C. S. Cathcart (1).

Hawaii

Mixtures of nitrate of soda, sulphate of ammonia, high-grade tankage, along with superphosphate and potash salts, were analysed both by the Gunning modified method (with the addition of mercury), and by a new method devised by the writer. By this new method the nitrogen was determined as under the following forms: Ammonia, nitric, total water soluble, organic residue, organic, and total.

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(1) See *Bull.*, March 1911, No. 773. (*Ed.*).

Mr. Peck believes that he has thus avoided two errors inherent in Cathcart's method of investigation:

1) the unreliability of the modified Gunning method in the presence of much moisture.

2) the uncertainity of moisture determinations in such a complex as a mixed fertilizer, with the unreliability of such a basis for comparative purposes.

The conclusion drawn from this investigation is that in presence of sufficient moisture, the modified Gunning method gives incorrect results, and that a mixed fertilizer containing nitrate of soda and acid phosphate does not even after a lapse of four months lose any nitrogen.

L. MALPEAUX. **The use of Cyanamide as a Manure.** (Emploi de la cyanamide dans la fertilisation des terres.) — *Journal d'Agriculture pratique*, 75 a., No. 47, pp. 647-651. Paris, 23 Nov. 1911. **60**

France

The author carried out practical manuring experiments both in pots and in the open ground for the purpose of checking and extending the tests conducted by others in regard to the use of the new nitrogenous manures.

The experiments on oats, beet, potatoes, swedes and poppy show that the results expected from the use of the various nitrogenous manures must vary with the nature of the soil and meteorological conditions. Each of them may,according to circumstances, prove superior to the others. Experience has long since given its verdict in favour of nitrate of soda and sulphate of ammonia, the conditions of use of which are to-day well-known. Nitrate of lime can be compared with nitrate of soda, and the price alone must decide the farmer in his selection between these two fertilisers. As to cyanamide, the lime it contains gives it the same superiority in certain soils (alluvium) over sulphate of ammonia, but the difficulty of its application may form an obstacle to the extension of its use.

Some quantity of oil is added to the manure ; an increase in the amount of oil would suffice to render the manure less powdery and facilitate the work of spreading it. The pot experiments went to show furthermore that ploughing in the cyanamide would always be preferable to superficial spreading. The author attributes this fact to a more rapid and complete diffusion of the constituents useful to vegetation. Harrowing, scarifying, or digging in the cyanamide to a depth of 2 to 4 inches, would secure the best conditions for its use.

61 W. P. KELLEY. **Assimilation of Nitrogen by Rice.** — (C. K. Mc Clelland, *Hawaii Experiment Station*). — *Farm and Ranch.* Dallas, Texas, September 23, 1911.

Hawaii

The writer calls attention to the fact that the conditions under which rice is grown are just the opposite to those which are necessary for nitrification; the soil is puddled to prevent loss of water, and the water excludes the air. This hinders or prevents the formation of nitrates, and furnishes ideal conditions for denitrification to take place, whereby nitrites and possibly free nitrogen are formed from the nitrates.

He quotes from bulletins of the stations of Texas, Louisiana, and Japan, where other investigators have shown the presence in such soils of larger quantities of ammonium compounds than of nitrates, and also that the formation of nitrates goes on much more slowly than does the formation of the ammonium compounds, and snggesting the probability that rice does use nitrogen in the form of ammonium.

The paddy soils of Hawaii seem to have the necessary amounts of other plant foods. Nitrogen alone gives increased yields. A table in this bulletin shows the comparative results of the use of nitrate of soda and of sulphate of ammonia upon three successive crops, and it may be added that a similar result was obtained upon the fourth.

In a series of pot experiments nitrates proved ineffective until near the heading period of the rice. Soy bean cake was far more effective, while ammonium sulphate was superior to all other fertilizers applied, the plants tillering better and reaching a greater height. Tests for nitrates, nitrites and ammonium compounds showed denitrification and the formation of nitrites, a lessened amount of nitrates and increased amounts of ammonia.

Experiments in flasks prove that denitrification is sufficiently active to account for loss of nitrates in the pot experiments, and that ammonification takes place to a considerable extent in submerged rice soil.

Cultures in sterilized sand (not however under sterilized conditions throughout) gave the following results.

Grams of paddy rice.

	Wet land Series	Dry land Series
Sodium nitrate	0	1.6
Calcium nitrate	3.7	—
Magnesium nitrate	6	2.7
Ammonium nitrate.	9	3
Ammonium phosphate . . .	16	—
Ammonium sulphate	32	4

The plants having ammonium sulphate or phosphate did well from the start, but those with nitrates did poorly at first, looked sickly and yellowish, but finally recovered, and made normal plants, except those in the wet land series with nitrate of soda, which entirely failed and finally died out.

If would seem from these results that rice has become so accustomed to using ammonium under the submerged conditions of growth that it retains its inability to use nitrates even when grown under dry land conditions.

The writer gives a further discussion upon the poisonous effects of nitrites as seen by the yellowing, and upon the inability of the rice plant to truly assimilate nitrates, and concludes that ammonium salts or organic nitrogen, and not nitrates, are to be recommended for rice culture.

B. L. HARTWELL and F. S. HAMMET. **The Effect of Phosphorus Manuring on the Amount of Inorganic Phosphorus in Flat Turnip Roots.** — *The Journal of Industrial and Engineering Chemistry*, Vol. 3, No. 11, pp. 831-832. Easton, Pa., November, 1911. **62**

United States

One of the writers has stated that the percentage of total phosphorus in turnips is influenced by the amount of available phosphorus in the soil. Advantage may be taken of this fact in ascertaining the relative deficiency of available phosphorus in the soil. It appeared, however, as a result of further study, as if the organic phosphorus is influenced even more than the total; if this be so, its determination would prove more useful for this purpose than that of the total phosphorus.

Microchemical examinations and quantitative chemical determinations were done on turnips from plots of the Agricultural Experiment Station, Rhode Island State College, and from cooperative experiments carried out in different parts of the State. All of the plots considered were well supplied with lime, nitrogen and potash. In each experiment, one plot did not receive any application of phosphate, a second received a liberal amount of acid phosphate, and a third still more.

As a result of a single season's observations, the microchemical tests showed on the whole that the relative abundance of crystals formed by adding the magnesium-ammonium salt solution to sections of the larger turnips grown on different soils is correlated, to a certain extent at least, with the relative amount of available phosphorus at the disposal of the plant.

Notwithstanding the uncertainties as to what constitutes so-called inorganic phosphorus and its determination, it appears from the results of the chemical determinations that, although the content of total phosphorus in turnips was nearly doubled by the addition of a liberal amount of acid phosphate, the content of inorganic phosphorus was increased about six-fold.

68 R. MARIANI. **The Consumption of Potassic Manures in Italy.** (Quanto spendiamo pei concimi chimici. Il pericolo dei calcoli). - *Il Coltivatore*, A. 57, No 31, pp. 403-405. Casale Monferrato, 10 Novembre 1911.

Italy

With regard to the statements of Professor Menozzi (1) on the consumption of manures in Italy, the author observes that according to the particulars supplied by the Stassfurt Potash Syndicate, the consumption of potassic manures in Italy in 1910 was as follows:

Qls. 36 000 of kainit frs 7	=	frs.	252 000
» 54 000 potassium chloride frs. 25	=	»	360 000
» 50 000 of potassium sulphate frs 27	=	»	350 000
Qls 140 000	Total	frs.	2 962 000

(1 quintal = 220.4 lb. 10 qls. =. 984 ton).

To this must be added 20 000 quintals of salts obtained from the utilization of beet molasses from Austria particularly, which at 22 frs, would represent a value of 440 000 frs. This means that the potassic products consumed in Italian agriculture amount at present, according to the author, to at least 160 000 quintals of the value of 3 470 000 frs.

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(1) See *Bull.* Nov.-Dec. 1911, No. 5123. (*Ed.*).

The World's Sulphur Production. — *The Engineering and Mining Journal,* Vol. 92. No. 19, p. 904. New York, November 4, 1911. **64**

The sulphur industry in the United States in 1910 was confined to the four states of Louisiana, Nevada, Utah and Wyoming. The production of sulphur for 1910 was 255 534 long tons, as compared with 239 312 long tons in 1909.

United States: Italy. Sicily. Japan

Italy is the leading country of the world in the production of sulphur. Italian sulphur comes from four districts, of which Sicily is the most important.

The sulphur of Sicily is found chiefly in argillaceous limestone associated with gypsum and bituminous marl. The richer deposits carry 15 to 20 per cent. sulphur, but certain deposits are known with 50 per cent, and in places 80 to 90 per cent are found. The methods of mining Sicilian sulphur are extremely simple.

For many years Sicily held a monopoly of the world's sulphur market. This monopoly has recently been broken by the exploitations of the sulphur deposits of Louisiana, by the Frasch process. As a result of this, in the year 1908 alone 80 small mines in Sicily were forced to suspend operations, leaving 404 still in operation.

The production of sulphur in Japan has increased in recent years. In 1908 it amounted to 33 785 long tons. Japan occupies the third place among the sulphur-producing countries of the world. Almost the entire output is exported, chiefly to America, Australia and China.

AGRICULTURAL BOTANY.

CHEMISTRY AND PHYSIOLOGY OF PLANTS.

G. E. Mattei. **A Clover new for Europe.** (Un Trifoglio nuovo per l'Europa). — *Malpighia,* anno XXIV, fasc. III, pp. 241-257 Catania, 1911 **65**

The examination of authentic specimens obtained from the Island of Tenos, in the Cyclades, leads the Author to add to the European species of *Trifolium* a new species, permanently established, *viz.* *T. pilulare,* the region of distribution of which was hitherto restricted to Asia Minor. This Clover has probably been transported to its new European habitat by the wind.

Greece: Cyclades Tenos

Some differential characteristics observed in the specimens from Tenos, due perhaps to the influence of the isolation suffered by *T. pilulare* in its insular environment, finally led the Author to take the view that these specimens are the representatives of a new variety (*T. pilulare* Boiss., var. *Mirennae* Mattei).

66 L. CLAVEAU. **Index of the Vernacular Names of some Plants of North West Africa.** (Index des noms vernaculaires de quelques végétaux du nord-ouest africain). — *L'Agriculture pratique des pays chauds*, 11e année, No. 103, pp. 333-340. Paris, Octobre 1911.

North-West Africa

This index of plants met with in North Senegal, Mauritania, the Sahara and South Algeria contains their names in Arabic, Berber, Moorish, Ouoloff and Tamâheq. The plants are classified in families and their names succeed each other in the order we have indicated above, preceded by the French name and the scientific name.

67 M. RADAIS and A. SARTORY. **The Mapon, a Poisonous Ericaceous Plant.** (Sur une Ericacée toxique, le Mapon). — *C. R. Ac. des Sciences*, T. 153, N. 20, pp. 964-967. Paris, 13 Novembre 1911.

Réunoin

The Authors call attention to the « Mapon », *Agauria pyrifolia* D. C., a variety of *Agauria salicifolia* Benth. et Hook., which occurs in Réunion.

The leaves of this plant are poisonous, with rapid and intense action ; they are fatal to animals eating them. Generally the native animals avoid them by instinct, the cases of poisoning observed relating chiefly to animals imported into the Island. The plant is likewise known for its revulsive properties, which disappear on drying, while the toxicity continues.

68 PIERRE BERTAULT. **Botanical Research into the Cultivated Varieties of *Solanum tuberosum* and the related wild tuberous Species of *Solanum*.** (Recherches botaniques sur les variétés cultivées du *Solanum tuberosum* et les espèces sauvages de *Solanum* tubérifères voisines). — *Annales de la Science agronomique*, 1911. 2e semestre. No. 1, p. 1 ; No. 2, p. 89 ; No. 3, p. 173 ; No. 4, pp. 248-291. Paris, Octobre 1911.

Mexico

According to the researches of the Author, the cultivated varieties of potato are all classifiable under a single botanical species, *S. tuberosum*, characterised by its floral constitution and particularly the rotate corolla, and the calyx with long-mucronate sepals. This great Linnean species is then subdivided into two sub-species differing in their foliage. These sub-species appear to be derived from the plants introduced into Europe in the sixteenth century. They comprise a large number of varieties in which the anatomic characters of the tuber, and in particular the starchy parenchyma, differ considerably; the indications supplied by the shape or colour of the tuber in distinguishing these plants are of similar importance. They are variety characters. Finally, other characters are essentially variable and depend immediately on the environment; such are the characters obtainable from the periderm. They are unstable and should not be taken into account. They are simply individual characters.

The botanical study of all the wild tuberous species of *Solanum* found in the principal European herbaria enabled the Author to investigate 35 clearly distinct species, three of which are new (*S. Edinense*, *S. lanceolatum* and *S. Cayeusei*) and to bring to light much confusion in the nomenclature of these plants.

Some of these species approach pretty closely to *S. tuberosum*, with which all the agricultural varieties of the cultivated plants are connected. But none of them can be identified with it absolutely, so that it is not possible to ascertain by a mere botanical study of these plants which of them is the unmistakable ancestor of the potato.

Nevertheless the examination of herbaria and collections leaves a doubt on this point. In the Drake herbarium there is a *Solanum* gathered by Heller at Cocustepec (Mexico) and described by him under the name of *S. tuberosum spontaneum*, which possesses all the characters of *S. tuberosum*; furthermore, in the collection of M. Ph. de Vilmorin, there is a plant designated by the name of " Papa d'Amarilla ", which is said to be spontaneous in the Amarilla Pampas, and which is also a *tuberosum* in all its characters. Which therefore is the ancestor of the agricultural plant? If the different species of *Solanum* possessing the floral character of *tuberosum* which have been gathered wild, are really spontaneous, the question would be solved, and one of these plants would represent the ancestor of the potato. Besides, whether these specimens be regarded as standing for spontaneous types or for plants which have reverted to the wild state, the conclusion resulting from all the facts set out in the course of this study remains the same: the ancestor of the potato always appears as necessarily a plant possessing the characters found fixed in all the agricultural varieties, those observed in the oldest cultivated potatoes and which we find unmodified in the most recent varieties. Therefore the ancestor of the potato would be a *Solanum tuberosum* the spontaneous form of which is now very rare, or has long since disappeared.

69 A. GORIS and M. MASCRÉ. **The Chemical Composition of some Higher Fungi.** (Sur la composition chimique de quelques champignons supérieurs). *C. R. Ac. des Sciences*, T. 153, N. 22, pp. 1082-1084 Paris, 27 Novembre 1911.

France

From the chemical study of some higher fungi, among others *Lactarius piperatus* Scop., *Lepiota procera* Scop., *Psalliota campestris* L., *Collybia maculata* Alb. and Sch., *Hebeloma firmum* Pers., *Craterellus cornucopioides* L. and several species of *Tricholoma* etc., the Author succeeded in isolating urea, two cholesterins identical in the species treated, and a new body extracted in particular from *Collybia maculata* Alb. and Sch.

The presence of urea is not constant, and setting aside the causes of error due to external influences, its occurrence varies with the time and the culture medium.

The various cholesterins detected in fungi are only mixtures of ergosterin and fungisterin. Finally the new substance extracted from *Collybia maculata* and *Hebeloma firmum* requires further study. The significance of the presence of urea in the higher fungi is not yet clearly determined.

70 J. B. PRIESTLEY. **Electricity in Relation to Horticulture**. — *Journal of the Royal Horticultural Society*. Vol. XXXVII, Part 1, pp. 15-25. London, October 1911.

Great Britain

The article under review deals with two methods in which electricity has been used in recent years to increase and accelerate the growth and yield of plants, viz. 1) the system of overhead electrical discharge; and 2) the use of the electric light in the greenhouse.

1.) The general principle of the systems of overhead electrical discharge, is to discharge electricity into the air above the plant, which will then find its way to the earth through the plant. The apparatus for generating electricity may take varions forms. In the earlier experiments some form of influence or friction machine was used, and for experiments on a comparatively small scale this method is still used. For experiments upon a larger scale, however, the newer " Lodge-Newman " system is much to be preferred, as it produces much greater *quantities* of electricity.

The writer describes a machine invented by him, and the "Lodge-Newman" system.

2.) Miss E. C. Dudgeon, of Dumfries, has tried the Cooper Hewitt lamp in forcing by electric light. Rapid germination and continued rapid growth resulted from the use of the lamp for a period of some 2 hours every evening after daylight had failed. As the mercury lamp did not raise the temperature the results cannot be attributed to forcing heat. The following plants were tried: — Chinese Beans, Indian Corn, Cauliflowers, Carrots, Mustard, Cress, Lettuces, Dwarf Vegetable Peas, Rose Tree, Carnation cutting, Pelargonium cuttings, Ivy-leaved Pelargonium, Strawberries, Figs, Tomatoes, and French Beans.

In the writer's opinion the very striking results obtained by Miss Dudgeon are presumably to be attributed to the extra supply of energy given to the plants in the two evening hours. Apparently the ultra-violet rays were of no harm to the plants.

The writer's experiments, however, like those carried out by Maquenne and Demoussy in France, show that too much ultra-violet radiation can be harmful. Some plants, for instance geraniums and *Tradescantia*, will wither in a day or two after only an hour's exposure to the rays, others, *e. g.* mustard, are more resistant. The action of the ultra-violet rays is restricted to the surface of the plant, because the rays are rapidly absorbed by the epidermis.

J. STOKLASA, E. SENFT, F. STRANÁK and W. ZDOBNICKY. **The Action of Ultra-Violet Rays on Vegetation.** (Über den Einfluss der ultravioletten Strahlen auf die Vegetation. Aus der Chemisch-physiologischen Versuchsstation an der k. k. Böhmischen technischen Hochschule in Prag). — *Centralblatt für Bakteriologie*, etc. II Abt., Bd. 31., No. 16-22, pp. 477-495 + pl. 4. Jena, 10 November 1911. 71

Austria: Bohemia

The question of the action of ultra-violet rays on vegetation and particularly on the green parts is unquestionably of great importance. Two of the authors have already established an essential point, namely, that ultra-violet rays, in the presence of potassium hydroxide, can bring about the synthesis of formaldehyde by carbon dioxide and hydrogen in the nascent state. (1). The question now is to ascertain what action these rays may have on the chlorophyll bodies, and this was the object aimed at in the present investigations, the results of which may be summed up as follows : —

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(1) See *Bull.* Feb. 1911, No. 384.

I. The leaflets of etiolated young shoots of peas, maize, oats and barley exposed to the action of the ultra-violet rays of a quartz mercury lamp, after two hours began to assume a deep green tint, while in order to obtain the same result from direct sunlight at least 6 hours would be required.

II. If the etiolation is prolonged by longer confinement in a dark chamber, the vital energy of the protoplasm is so greatly altered that the ultra-violet rays are no longer capable of causing the formation of chlorophyll as rapidly as in the previous case.

III. The etiolated leaves of sugar beet exposed to the ultra-violet rays took on a visible green at the end of an hour, and, at the end of two hours, they acquired a dark green colour, while in diffused sunlight their yellow colour hardly changed. From the morphological point of view differences were also observed : the etiolated leaves had their limb strongly curved inside and on their lower surface the primary ribs were greatly developed, while the secondary ones were hardly visible ; the leaves exposed to diffuse sunlight had their limb much crumpled and on their lower surface the secondary ribs were conspicuous ; finally, the leaves exposed to ultra-violet rays had their limb well extended and very much crisped at the end with all the ribs completely developed. Furthermore, the leaves which had been subjected to artificial light, kept well in water for more than a week, while the etiolated leaves and those exposed to sunlight faded within 3 days.

IV. The young shoots of the above mentioned plants exposed for two hours to the ultra-violet rays showed no chlorophyll decomposition in their cells.

V. As the action of the ultra-violet rays, with or without screen, at 35 centimetres distance, was identical, it may be assumed that the most extreme ultra-violet rays have no action on chlorophyll.

VI. Young green leaves exposed for 4 hours to the ultra-violet rays shrink, and the protoplasm of their epidermal cells is altered and killed so that they turn brown progressively under the action of atmospheric oxygen.

VII. The protoplasm of the cells of flowers is much more liable to alteration by the ultra-violet rays ; within two hours they begin to droop, and within four hours they are dead. Moreover, the flowers and leaves of plants cultivated under glass are more sensitive to the action of ultra-violet rays than those growing in the open air

VIII. According to the observations of the Authors, the most effective ultra-violet rays in clorophyll synthesis are the most refrangible.

IX. Bacteria prove to be extraordinarily sensitive to the action of the ultra-violet rays. Cultures of *Azotobacter chroococcum* exposed to the direct action at a distance of 10 centimetres, are entirely killed within 8 to 10 seconds ; the least refrangible rays are the most active. This fact is of considerable importance even from the practical point of view, in view of the essential part played by *Azotobacter* in the soil, in the fixing and assimilation of free nitrogen.

MARIN MOLLIARD. **Action of various Polyureids and of Hippuric Acid on the Growth and Root Development of the Radish.** (Action de divers polyuréides et de l'acide hippurique sur le développement et la tubérisation des Radis). — *C. R. Ac. des Sciences*, T. 153, N. 20, pp. 958-960. Paris, 13 Novembre 1911. **72**

France

The fact brought out by the Author on other occasions, of the the utilisation of urea by the higher plants, suggested the study, from the same point of view, of the derivatives of urea known under the name of polyureids. Aseptic cultures of radish were conducted in nutritive solutions in pumice-stone, and containing the mineral salts recognised as necessary for the growth of the plant, and also glucose in a proportion of 5 per cent. To the control solution, which contained no trace of nitrogenous substances, there was added 1 per 1000 of the different substances tested. If the attempt be made to establish a relation bewtween the chemical composition of the nitrogenous substances placed at the disposal of the radish in this way, and the dry substance in the crop, it is observed that the toxic character is connected as regards theobromine and caffein, with the methyl radical; that sarcine, barely toxic, is an amino-oxyhippurine; and that xanthine (dioxyhippurine) and uric acid (trioxy-hippurine), in the state of urate of sodium, produce a fuller growth than nitrate of sodium and ammonium chloride, as likewise does allantoin.

Generally, the water-content increases with all nitrogenous substances except as regards caffein, which does not allow of any growth.

From the point of view of root formation, the Author observed, on making 100 cultures for each of the substances, nitrate of sodium, urea and urate of sodium, that the last named very noticeably promotes root formation as regards frequency as well as the total yield of dry substance, also by a much earlier apperance of the swollen part of the root.

With regard to hippurate of sodium, it appears to be toxic, and this property must probably be attributed to the existence of an aromatic nucleus.

73 J. VIOLLE. **Temporary Reversion to Single Flowers in a Double-flowered Rose.** (Sur un retour momentané des fleurs doubles d'un Rosier à la forme simple). — *Comptes Rendus Ac. des Sciences,* T. 153, No. 20, pp. 915. Paris, 13 Novembre 1911.

France

A splendid Gloire de Dijon rose bush, planted in the open about ten years ago, and having exhibited remarkable growth and vigour, suddenly displayed a complete flowering of entirely single roses about the 12th September, after having stood the torrid heat of this summer. This flowering was followed eight days later by the opening out on the same branches of fine ordinary roses which continued as usual.

74 J. LAURENT. **A Fresh Case of Autumn Flowering caused by a Fire.** (Un nouveau cas de floraison automnale déterminé par un incendie) *Comptes rendus hebdomadaires des séances de la Société de Biologie.* Tome LXXI, No. 31., pp. 406-408. Paris, 17 Novembre 1911.

France

On the 29th July 1911 a violent fire broke out in the village of Bossuet, 12 kilometres north of Vitry-le-François (Marne). In the neighbouring gardens the trees nearest the seat of the fire were entirely destroyed, but those which were 25 to 50 metres away were not killed by the heat. On the 23rd August following, a number of these latter, pears, apples, service trees, hawthorns, chestnuts and lilacs, were covered with flowers just as in spring.

The apples lost their leaves in the usual way with the formation of a corky scar; the fruits hung on, but some side or even terminal buds differentiated into fruit buds and these opened out into short branches bearing 6 or 8 leaves and ending in a flower cluster.

On one lilac the Author noted three kinds of branches clearly indicating the progressive action of the heat: on the side away from the fire they had remained normal; in the centre of the shrub the leaves had fallen, but among the buds in their axils, the most differentiated, which are generally those at the top, opened out either into leafy shoots or into inflorescences which were remarkable for the exceptional growth of the bracts at the base of each of the branches of the panicle. On the side next the fire, the branches still bore withered leaves.

As regards the interpretation of these facts, which for that matter are not new, the author refers to the enquiries into " anhydrobiosis " carried out by Giard. The dehydrating action of heat was followed by a re-hydration which was possible, notwithstanding the drought of the summer, owing to the maintenance of the absorbing activity of the roots, which continued to draw from the soil a sufficiently large quantity of water for distribution to the few continuing leaves and above all the buds. The result was, in these latter, osmotic disturbances capable of giving rise by a sort of mechanical dis-engagement to cellular proliferation which afterwards continued until the autumn. The water supplied to the buds even sufficed to produce exceptional growth of the bracts in the inflorescences of the lilac and the appearance of a larger number of leaves than usual at the base of the corymbs of the apple tree.

The observations made at Bossuet on the lilac suggest to the author that the difference between the deciduous, withering and persistent leaves may perhaps result from different mechanical processes by which dehydration takes place in the autumn.

SELECTION.

P. HILLMANN. **The Improvement of Plants in German Agriculture. Works of the German Agricultural Society.** F. 168, pp. XXXVIII + 622 + p. 1 + figs. 346 + 1 carte. Berlin 1911. (1) **75**

Germany

The improvement of plants in Germany only began in 1890 to assume the enormous proportions by which it is at present characterised. It derived its most energetic impulse from the great economic

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(1) Other Sources :

FRUWIRTH, *Die Züchtung der landwirtschaftlichen Kulturpflanzen;* Bd. I, 3 Aufl.; Bd. II, III, IV, 2 Aufl. Berlin, 1909-10.

W. RIMPAU, *Züchtung neuer Getreidearten, Landwirtschaftliche Jahrbücher,* 1877, 193; *Das Blühen der Getreidearten,* ibid., 1882-833; *Kreuzungsproduktion landw. Kulturpflanzen,* ibid., 1891, 375

Publications of the *D. L. G.* (*German Agricultural Society*):

— *Jahrbuch* (Year-Book); *Arbeiten* (Works); *Mitteilungen* (Communications); *Anleitungen für den praktischen Landwirt* (Practical Farmers' Guide); *Flugschriften, Flugblätter* (Circulars and Leaflets).

— *Mitteilungen der Saatzuchtstelle über wichtige Sortenversuche* (Communications of the Seed Improvement Section on the Tests of the most important Varieties); *Sortenliste der Sortenversuche der D. L. G. in Verbindung mit land-*

success of the first breeders, the progress in the teaching of improved methods of cultivation in German Universities, and the action of the German Agricultural Society (Deutsche LandwirtschaftsGesellschaft, D. L. G.,) as regards the improvement of seed. In order to gauge this mighty expansion, it is sufficient, on the basis of the data supplied by the present work prepared for the D. L. G. by Dr. P. Hillmann, Chief of the Seed Improvement Section, to give an enumeration of the different seed-breeders in Germany; thus there are found 43 for Winter Rye ; 3 for Spring Rye ; 61 for Winter Wheat ; 23 for Spring Wheat ; 5 for Winter Barley ; 60 for Spring Barley ; 53 for Oats; 23 for Mangels ; 31 for Sugar Beet ; 17 for Potatoes; 4 for Cabbage, Carrot etc. ; 8 for Clover and Grass ; 23 for Leguminous plants.

Of prime importance in the developmnet of seed improvement was the foundation of the Seed Section of the D. L. G. in 1886, which Section later on assumed the name of the " Seed Improvement Section ". This section led to the convergence at a single centre of the breeders' efforts and rendered possible the regular exchange of experience gained in cultural improvement.

The work of the Section for Seed improvement is now directed in the following channels :

1. Lectures to meetings of the Section. At these lectures, German and foreign scientific men of note give an account of all essential progress in the improvement of plants, so that the Proceedings of the meeting published in the yearly volumes of the D. L. G. are a faithful portrayal of the entire evolution of this science in Germany during the last 20 years.

2. Competitions with prizes among the various farms for the improvement of seeds. This institution has been a powerful stimulant and encouragement to the branch, and the inspections which are repeated at an interval of several years have given rise to reports which are often quoted in the agricultural literature of different countries.

3. Organisation of the tests of varieties, with the co-operation of agricultural institutions. These tests fulfil a task of essential im-

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wirtschaftlichen Körperschaften (List of the Varieties tested by the D. L. G. with the Co-operation of Agricultural Societies); *Saatliste der Saatstelle* (List of Seeds of the Seed Office).

— *Grundregel für die D. L. G. Anerkennung von Saaten* (Fundamental Rules for Recognition of the Seeds by the D. L. G.); *Grundregel des Hochzuchtregisters der D. L. G. für Pflanzenzüchtungen* (Fundamental Rules in Relation to the D. L. G.).

— *Geschäftsbericht der Saatzuchtabteilung für das Jahr 1910* (Report of the Plant Improvement Section for 1910) (*Author's notes*).

portance to agriculture, the determination of the growing value of new or current varieties. The D. L. G. publishes a yearly provisional Bulletin on the mean results of the trials, and after several years' trials detailed reports. In future half-yearly reports will also be published, arranged according to regions and soils.

4. Recognition of Seeds. Recognition by the D. L. G. is granted as a result of an inspection of the fields infended for seed-growing, accompanied by inspection of the installations for the preparation of good seed ; these inspections are carried out by officers of the D. L. G., assisted, where necessary, by the delegates of affiliated unions for seed cultivation.

The inspection takes account in particular of :

a) Equality ; specific purity ; absence of foreign varieties in the product ; absence of weed ; absence of plant diseases ; prevention of cross-fertilisation.

b) Adoption of special measures for obtaining good seed, namely reproduction on the right lines of the improved products, or test of improvement methods and equipment.

5. Register of the D. L. G. for Plant Improvements. In this register entry may be made of improvements in cultivated plants brought about methodically and on scientific growing principles, provided they have been conducted within the boundaries of the German Empire. The object of the entry is to promote the procuring by means of the improving treatment, of pure strains of agricultural plants ; to protect improvements of original seeds against unfair competition ; to protect seed buyers against fraud in relation to the origin of the goods. As to this, the entry confers the privilege of using the distinctive authenticity mark of the D. L. G. The number of varieties at present entered in the register is 28 : 3 being varieties of Rye, 4 of Wheat, 2 of Barley, 4 of Oats, 6 of Mangels, 2 of Sugar Beet, 2 of Peas, 1 of Haricots and 4 of Potatoes.

6. Encouragement of the cultivation of Clover and Grass for seed in Germany by establishing competitions with prizes among the farmers and associations undertaking the production of these seeds; also journeys for study ; reports on the improvement of forage plants abroad, etc.

7. Participation in national and international exhibitions by the organisation of collective growers' exhibits. Mention should here be made of the exhibit at the Paris Universal Exhibition 1900, to which 7 Grand Prix and 4 Gold Medals were awarded, and the exhibit at the Universal Exhibition of Brussels in 1910, in which 31 breeders took part, who all received awards with the exception of one hors-concours.

8. Information Department as to the value of seeds and improvement in general.

Nevertheless the D. L. G. has not confined itself to these operations as intermediary and expert ; since 1888 it has been the connecting link between the seed grower and the farmer, and has undertaken the supply of Clover and market seeds by the establishment of the Seed Office. The object of this Office is on the one hand to create markets for the products of reliable growers, and on the other hand to introduce on the agricultural market a higher guarantee of authenticity and quality in purchase and sale operations. It uses every endeavour therefore to supply the buyer with authentic varieties of good quality, and sees that all requirements in regard to purity and germinating power are fulfilled. The Office also acts as an expert in fixing the purchase prices ; it watches over the proper execution of commercial transactions, and for this purpose has recourse to the arbitration board appointed for that purpose by the D. L. G. Other agricultural associations are following along lines parallel to those of the D. L. G. These are · the Federation of Agriculturists, which has itself established a Seed Office and the inspection of original seed farms ; the Agricultural Co-operative Societies which undertake the sale of the improved seeds ; and the Society for promoting the Improvement of Plants in Germany, which undertakes the defence of the interests of plant growers, for scientific purposes.

The work we have cited above sets out to give the reader accurate, rapid and complete information as to the extent already attained in Germany by improvement work in agriculture. After a historical survey, the first part of the work is devoted to the scientific institutes engaged in the improvement of plants; the second deals with improvement in practical agriculture.

According to this work, there is in Germany no central scientific establishment for the improvement of plants, and this is generally regarded as an exceedingly happy fact, for if there were any such institute, there would, it is said, be some apprehension that thus individual scientific activity might be impeded and a predominating direction be established which would paralyse all initiative which ran counter to it. It is a practical farmer, Councillor W. Rimpau of Schlansted, who, owing to his work, is the true promoter of the scientific agricultural breeding of cereals in Germany. It was only in 1889 that Professor von Rümker held his first course on the improvement of plants in a Higher School at Göttingen. From about the same time date also the beginning of the original enquiries, made both by the teachers of agriculture and plant cultivation and their pupils in agricultural institutes, to endeavour to establish the bases for the improvement of plants. In contrast to the Agricultural Testing Stations (which, together with control work, furthermore undertook scientific enquiries on the cultivation of plants, and generally dealt with the chemical study of the soil and the use of manures, at most extending their work to the tests of varieties), these representatives of agricultural education and plant cultivation proper, with their more universal view of the science of agriculture, turned more and more towards the "breeding" of plants, which has thus in many agricultural institutes gradually taken the leading place in their scientific instruction. It will readily be understood that in consequence of this interest in the cultivation of plants, the majority of the German University Institutes and the great agricultural schools are represented in the first part of the work of Dr. Hillmann.

Nevertheless, there are State Institutes for the improvement of Seeds, which are an innovation which has sprung up in some German Confederate States, particularly in the South of Germany, where medium and small holdings predominate. In these cultures initiative is, comparatively speaking, much more limited than on the large farms in the North of Germany. This has been sought to be remedied by the creation of establishemens themselves engaging in the improvement of the native species, or by leaving this matter in the hands of farmers and co-operative societies, while giving them the benefit of close supervision. The centres of these organisations are : The Royal Institute of Hohenheim in Württemberg, the Royal Insitute for Seed Improvement at Weihenstephan in Bavaria, and the Grand Ducal Institute of Hochburg in the Grand Duchy of Baden. In the Kingdom of Saxony, for the creation of an organisation of this kind, the Agricultural Section of the Plant Physiology Testing Station in Dresden was appealed to. Finally, in other places likewise, advantage was taken of existing institutes for the same object.

It will therefore be seen how varied are the scientific institutions under whose patronage the improvement of seed is developed in Germany ; still more varied were its practical results. Whereas a few years ago, co-operative societies and unions of plant "breeders" were numbered, to-day almost every province and a large number of the smaller States have their own associations for seed culture, generally in the form of small bodies of producers of improved seed, ensuring mutual recognition and joint disposal of their products. The majority of these associations are under the supervision of the agricultural co-operative societies, from whom they receive money grants. The old plant-breeders, who some years ago were alone in this work, have had many successors, so that at the present time there are agricultural breeding farms in all stages of development. The different articles in the second part of the above work trace out the historical evolution of each important farm, and give a general idea of the variety of the installations comprised in a modern plant improvement establishment. Mention is made not only of breeders, but also of big concerns which have set themselves the task of multiplying those improved products which have stood the test, for the general needs of the seed trade.

In the very heart of Germany, in the province of Saxony, the endeavours to improve seeds were carried out on the largest scale. Then follow the Duchies of Brunswick and Anhalt enclosed within the territory of that province, and where the position of matters is almost the same. In Hanover, the agricultural breeding farms of which are in the vicinity of Saxon territory, there is almost the same state of affairs. Then come the Kingdom of Saxony, Thuringia, and the Province of Hesse, the importance of which from the point of view of practical improvement has up to now been far less, and the Grand Duchy of Hesse. To this nucleus are added the Western regions : Westphalia and the Rhenish Province, and then the Southern states. Finally there are the Eastern Provinces, which present different climatic and geological characters : Brandenburg, Silesia, Posen, the Grand Duchy of Mecklenburg-Schwerin and Strelitz, and Schleswig-Holstein. There should be indicated as localities of particular importance for agricultural seed improvement : Quedlinburg, skirting the Harz on the North, and Schlanstedt, also in the province of Saxony.

In conclusion it may be said that in the matter of the trade in cereal seeds, German agriculture has entirely emancipated itself from intermediaries. In most instances the grower himself, or again the Seed Office of the Co-operative Societies, such as the D. L. G., sell direct to the seed-buying farmer. As regards Potatoes a solution has been found of the problem of raising them to the highest degreee of cultivation in regard to the yield of starch, flavour and strength, by the selection of the best varieties for seed cultivation, by methodically repeated crossings and by new selections from the seed thus obtained. With respect to the trade in the Sugar-Beet Seed, the seed producers are in direct relations with the factory managements and foreign representatives. The Mangel trade is in many instances. especially as regards small retailing, a monopoly of this part of the seed trade; and it is impossible to form a judgment as to the latter's efforts in the direction of improvement. Vegetable and flower seeds, which are not considerd in the above work, are generally supplied by the seed producing farms, which are concentrated at Quedlinburg in particular, and the flower seed works at Erfurt chiefly. On the other hand the trade in Clover and Grass seeds is the exclusive appanage of the seed trade proper, German production in this branch hardly counting for the present, and it is more and more monopolized by very small farms which are quite unorganized as regards the seed trade. For this reason Germany is compelled to obtain from abroad the greater portion of its Grass and Clover Seeds, which unfortunately at times are in a very small degreee adapted for transplantation. Nevertheless the repeated endeavours of the D. L. G. to extend the improved cultivation of forage plants in Germany show prospects of good results.

ALFRED HUMMEL. **The Value of Different Systems of Selection.** (Die Ausleseverfahren in der Pflanzenzüchtung). — *Fühlings Landwirtschaftliche Zeitung*, 60 Jahrgang, Heft 22, pp. 761-780. Stuttgart, 15. November 1911. **76**

German.

The Author sets out the results of many experiments carried out by him in 1910-1911 at Neustettin, to determine the value of the different systems of selection at present in use.

The first part of his work comprises a statement and discussion of numerous data which enable an idea to be formed of what is obtainable: (1) by the choice of plants: selection en masse; (2) by the choice of progeny (choice of a single starting individual); (3) by the alternate choice of plant and progeny (individual selection with repeated or continued selection of individuals and progeny).

The second part of the work generalises the conclusions and aims at a schematic demonstration of the efficiency of the various methods applied to the same materials. The chief obiect is to bring out clearly the joint (resulting) action of the elements "selection en masse" and "individual selection" in the different selectinig methods.

For these experiments *Brassica Rapa oleifera* was the plant chiefly used, but *B. Napus* was also employed. In 1910, we have for *B. Rapa* 100 descendants (families) originating from distinct plants (1909). From a large number of these descendant families there were selected at the end of May 1910 some plants which were numbered (mother plants). As the character to be selected there was chosen the "time of flowering", a distinction being made between the plants of early, average and late flowering. In autumn the seeds were gathered, and those of each plant were sown separately on plots of a surface of 9.20 square matres. (11 sq yds.). In the spring of 1911 the moment of flowering was noted on the different plots.

Selection en masse. The seed gathered in October 1910 was divided into three groups: early, medium and late flowering. In the following spring the following results were observed: the selection en masse for early flowering caused about one day's advance in the time of flowering in relation to the average, and delayed it one day in the case of late flowering.

Single individual initial selection. While selection en masse can be carried out for years, getting constantly nearer to the end in view, here on the contrary the selection of the different individuals is made once from time to time. In the present instance the results obtained were favorable, with an interval of 4 to 6 days between early and medium flowering; while with selection en masse we have an interval of 2 to 3 days between early and late flowering..

Individual selection with continuous selection of individuals. This is a combination of a selection of several plants (selection en masse) and some descendants (individual selection). In the selection en masse the inheritance of the characters by each plant is not certain; nevertheless improvements may be obtained. The descendants on the contrary transmit their characters with greater constancy; therefore the simultaneous use of the two methods should give good results. For instance, when selecting for early flowering the choice is made from among all the earliest descendant families, which gives the advantages we have referred to above; then among these families the earliest plants in turn are chosen.

The families descending from these plants are cultivated separately and in the following year the same method is adopted in selecting the families and early plants. By using this system the time of flowering was advanced 1 to 3 days, for in the spring of 1911 the average date of the 12.0 May was obtained for the 46 descendant families en masse, and that of the 11.6 for the families descended from early flowering mother plants.

Individual selection with continuous selection of one individual per year. As for the previous system, with the sole difference that only one individual is selected per descended family. As the inheritance of the characters in the individuals chosen is not certain, the results obtained depend only on chance.

In the second part, the Author considers selection en masse and individual selection as distinct elements, and he sets out in a curve the advantages obtained by applying them in a different degree in the methods of selection.

The alternate selection of descendant families and plants (individual selection with continuous selection of individuals: pedigree selection) as a whole forms the most rational method and the most advisable, as is proved indeed by the experimental data.

N. H. NILSSON. **Seed Selection in Sweden.** (1. Aterblick pâ Sveriges Utsädesförenings 25 - Ariga verksamhet). — *Sveriges Utsädesförening,* 1886-1911. *Sveriges Utsädesförenings Tidskrift,* A. XXI, H. 4., pp. 175-187 + pl. 7. Malmö, 1911. (2. Arsberättelse ofver Sveriges Utsädesförenings verksamhet under âr 1910). Ibid., pp. 188-199 (1). 77

Sweden

In 1911, the 25th anniversary of the foundation of the Swedish Seed Improvement Society occurred.

It was in 1886 that, at the initiative of some farmers interested in the question, a society was formed for the improvement of seed in South Sweden (Sydsvenska Utsädesföreningen) ; three years later this Society absorbed another which had been created with the same object, in the central provinces of Sweden (Mellersta Sveriges Utsädesförening) ; and having thus extended its sphere of action to the whole of Sweden, it finally took the name indicated above (Sveriges Utsädesförening).

The object of the Society is to carry out experiments in the different parts of the country in order to determine the economic value of the varieties and strains of cultivated plants, to improve Swedish cultures by systematic selection of new species superior to those already in cultivation and finally to promote the dissemination of new species.

The process of improvement consists principally in the selection of variations of one and the same individual plant, forming what is called "pedigree" culture. The plants taken as the basis of this treatment are often mixed with other variations already cultivated, which are in turn mixtures of a lesser or greater number of different forms. In many cases artificial fertilisation is even resorted to. However the case may be, these variations are cultivated separately for some years, to enable them to be studied from the point of view of their constancy and their quality. Those which seem to be worth it are afterwards cultivated on a larger scale for several years more, and in those regions of the country which appear to be most favorable to them. Finally, after being subjected to careful observation, over a sufficient length of time, the approved forms are supplied to farmers.

The first work was carried out with cereals — Wheat, Rye, Barley and Oats — and with Peas and Vetches. In this way the Society introduced a number of new varieties of indisputable value into practical agriculture; they have taken the place to a great extent of the varieties which had been most cultivated before, especially in Southern Sweden.

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(1) Other sources: H. J. DANNFELT, *Aperçu sur les Institutions agricoles de la Suède,* 147, pp. 29-31. Stockholm, 1910. *Styrelseberättelse, Sveriges Utsädesförenings Tidskrift,* A. XXI, H. 4., pp. 200-203.

Latterly, forage plants and Potatoes have been taken into consideration, using the same methods as had been applied so successfully for Cereals and Leguminous plants.

The selection and hybridisation experiments are carried out both at the Central Institute in Svalöf, in Scania, and to a small extent in the two branch stations of Ultuna near Upsala, Central Sweden, and Luleâ in the extreme North. New varieties are chiefly studied, in the two branches, from the point of view of the climatic conditions in the different regions, before they are supplied to farmers. Each new variety is then tested in a number of experimental fields belonging to private owners in the provinces where it seems to admit of cultivation to advantage.

The Society receives an annual State grant of 40 000 Kronen, (£ 2 250) and about 15 000 Kronen (£ 844) from agricultural economic Societies. Consequently the Government and the Societies in question form part of the Board of Management of the Society.

The 1910 Budget comprises a total expenditure of 778 642 kr. (£ 43 793 12 s.), 103 511 kr. (£ 5 822 10 s.) being for current expenses, 164 433 kr. (£ 9249 7s.) for real property, lands and buildings, and a sum of ready cash of 103 286 kr. (£ 5 809 16 s.) for the latter.

The Articles of the Society have been sanctioned by the King of Sweden, who appoints one of the members of the Board and one of the three Auditors of the Accounts and Balance Sheet of the Society. The Direction of Agriculture of the Swedish Government is furthermore entrusted with supervision over the Society.

With regard to the administration of the latter, it is in the hands of a Board and an executive committee. The Board consists of the honorary members of the Society, all the members of the executive and the representatives of the agricultural economic Societies which pay an annual contribution of at least 500 kr. (£ 28 8s.); it deals with general questions relating to the work of the Society.

The executive committee consists of the member appointed by the King, three members elected by the Board and three members and three substitutes elected by the general meeting.

In 1910 the permanent staff consisted of twelve officers, and the temporary staff of eight; total twenty. Until the end of 1910, the Society had put on the market 117 selected products, 8 of them in the course of that year. The properties under control, which numbered 210, representing an area of 4587 hectares (11 330 acres) in 1909, rose in 1910 to 246, representing 5686 hectares (14 044 acres). In the course of the latter year there were analysed and controlled 89 800 specimens for account of the Swedish Seed Co. Ltd.

As to this latter (Allmänna Svenska Utsädesbolaget), it exists side by side with the experimental institution of the Swedish Seed Improvement Society; it has its chief office at Svalöf and two branches at Norrköping and Gótenborg. This commercial undertaking serves as an intermediary between the Seed Improvement Society and agriculturists. Under the control of the officers of the latter, the former grows in quantity and puts on the narket the new varieties found by the scientific institution. The conditions on which the commercial company takes over the new varieties or strains are fixed by a Commission of three members, one of whom, the president, is appointed by the King of Sweden and the two others by the two Boards of the Scientific Society. The latter receives a very moderate fixed price for the products obtained, and an annual royalty proportionate to the total sale of seeds from the varieties produced. Thus in 1910 the Improvement Society received from the limited Company 31 348 kr. (£ 1763 6s), which, it is true, included 6000 kr. (£ 337 10s.) annual contribution.

The commercial Company also sells other seeds, and each of the undertakings has its distinct management and staff; each has its clearly defined sphere of operations and its special premises.

Resistance to Cold. In-Breeding and Cross-Breeding. (The Fourth International Conference on Genetics, Paris). — *The Gardeners' Chronicle*. No 1295, Vol. L, p. 287. London, October 21, 1911. **78**

Sweden

Dr. H. Nilsson-Ehle, of Svalof, Sweden, contributed to the Fourth International Conference on Genetics, Paris, a paper entitled *Acclimatisation by Recombination of Mendelian Factors*. In the period previous to exact experimental work in genetics, much loose talk was heard on the subject of acclimatisation. It was known that when, for example, cereals are grown in a country the climate of which is colder than that of the country of their origin, the « race » might become hardier. It was assumed that the race, as a whole, had undergone a change in response to the change of climate; in short, that a mutation had occurred. Nilsson-Ehle has shown, however, that what really happens is that the climate acts as an eliminator of the more delicate members of the original race, and that the supposed new and hardier race is composed of the descendants of the original small band of plants which possessed factors for hardiness.

The old assumption that, because a race is pure with respect to certain characters, it is pure with respect to others, has been shown to be erroneous, and, in the case under consideration, the original « race » was composed of members which differed widely from one another with respect to hardiness ... If a *high degree* of cold resistance is a matter of indifference to the grower who raises the variety for use in a given locality, the variety is practically sure to be « impure » with respect to this character. What is a matter of indifference in the original locality may become of critical importance in a new region of harder climate. There natural selection will begin to do the work left undone by artificial selection, and will destroy those which have not the powers requisite to resist the climate of the new region.

How selection — natural or artificial — works in such cases is the problem which Dr. Nilsson-Ehle sets himself to solve. He gives evidence to show that qualities such as resistance to cold, precocity of flowering, etc., each depend generally, not on single Mendelian factors, but on a series of factors; hence the business of the breeder is to bring about, by cross-breeding and isolated raising of F_2 and subsequent generations, the various combinations of these factors, some of which combinations will result in increased hardiness or other desired quality. The practical importance of this view lies in this, that, if the Mendelian factors concerned are but few, the desired result may be obtained in a few generations; but if they are numerous, it may take many generations before the best set of factors come together, and combine to produce the desired result.

A point of practical importance in connection with the raising of cold-resistant varieties was made by Dr. A. L. Hagedooen, in the course of a communication on " *Genetic Factors and Environmental Factors in the Improvement and Raising of Varieties* ". When the object of the breeder is to raise by hybridisation a cold-resistant variety, it is not necessary to subject the first (F_1) generation to the test of culture in a cold situation — and the same applies in drought-resistance experiments — for the first generation may well be susceptible to cold, and hence suffer destruction. All that is necessary in such experiments is to raise an abundant second (F^2) generation, and to subject the members of that generation to the test of cold or drought.

Mr. Bruce contributed a paper on the subject of " *Heredity of quantitative Characters* ". He pointed out that many of the characters which are of the greatest practical importance are not qualitative, but quantitative in nature; for example, milk yield, seed yield, and so forth. From experiments made with barley he had not been able to discover that the characters which he had investigated were susceptible of Mendelian analysis. To determine whether the Mendelian hypothesis of unit characters is applicable to quantitative, as well as to qualitative characters, and also to ascertain whether increased vigour attributed to cross breeding, and reduced vigour, said to accompany in-breeding, are Mendelian phenomena, would mark a great advance in our knowledge of genetics.

L. ALTHAUSEN. **The Separation of Forms of Buckwheat according to the Qualities of the Seed.** (K. Vedicleniiu Form u Grecikhi po sernu). — *Kurnal Opetnoi Agronomii* (Journal d'agriculture experimentale). G. XII, Kniga 5, pp. 668-673, 8 pl. S. Peterburg, 1911. **79**

Russia

In selecting Buckwheat the properties of the seed must of course be taken into account. On the one hand it is sought to obtain a given result (for instance remarkable size or weight), on the other, the variations as they present themselves are studied without regard to their practical interest.

This method of procedure is justified by the fact that the value of a character can only be clearly determined *a posteriori* by checking by actual culture.

If cross-fertilisation be allowed to take its course in Buckwheat fields without putting artificial selection into operation, some want of uniformity is observed in the seed of the parent plants and of the offspring.

Nevertheless it is possible, by individual selection of the parent plants, to obtain a stable separation of forms, as has been proved by the numerous experiments made by the Author.

In 1910 there were selected 3 seeds, or, if necessary, only 2 or even 1 of each plant, per family. By sub-dividing the offspring into groups according to the character under examination, remarkable uniformity was secured. Parent seeds of elongated form transmitted this character to their descendants, and the same applies to colour, size, etc.

The separation of forms is therefore possible either directly (selection of the best seeds), or indirectly (elimination of the worst). Buckwheat from this point of view is highly plastic, which affords the best prospects for the improvement of this crop, the production of which has materially declined in Russia recently.

80 C. G. WILLIAMS. **Selection of Seed Corn (Maize)** (1). — *The Missouri and Kansas Farmer.* Kansas City, Mo., October 1, 1911.

United States

Ears of corn are not always as valuable as their appearance would indicate. Excellence may be due to hereditary influence, or it may be due largely to external influences. It is exceedingly difficult to carry from one generation to another excellence which is the sole product of environment, unless the environment is carried along with it.

Many corn growers are sadly disappointed in their purchase of seed corn for this reason. Seed corn excellence which rests mainly upon environment is not very valuable. What is needed is excellence which is hereditary. By selecting seed corn upon the plant as it is ripening, one stands a much better chance of securing the latter.

The variation in the time of maturing existing between individual plants of a given variety affords ample opportunity for the development of strains in which the character of early maturity is hereditary.

Vigor, as evidenced by circumference of stalk below the ear, by freedom from disease, by leaf development and especially by ability to stand upright until harvest, is a character worthy of consideration. In the selection of mother plants the position of the ear on the stalk should be noted and extremes avoided.

The continuons selection of the higher ears tends probably toward later maturity, as also the selection of extremely low ears tends to reduce the size of plant, shorten the growing season, and of course to decrease the yield. The seed and market condition of corn is greatly increased, if the tip of the ear points downward, thus shedding water.

Weight of ear may mean much or little, according to whether environment or heredity are the controlling factors in its production. If stand of plants and conditions of fertility are uneven and seed ears are selected without regard to such conditions, weight of ear is not especially significant. If, however conditions are qiute uniform, weight of ear is one of the best indications of productiveness one has. It should, of course never be considered apart from maturity.

Referring to his own studies on the relation of weight of seed ear to yield, the writer has found, upon dividing all the seed ears tested up to this year into two classes (medium heavy and medium light), a gain in yield of 5.9 bushels per acre for the heavier ears even though the difference of weight was on the average but 2.06 ounces per ear.

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(1) See *Bull.* Dec. 1910, p 240, and June 1911, No. 1653. (*Ed.*).

Of the two factors which certainly have much to do with weight of ear, length and circumference, the writer's tests so far have shown that length is of much greater significance than circumference. Ears a little above average length for a variety and locality have yielded more bushels of corn per acre than ears falling below the average length, while ears of large circumference have proved lower yielders than those of medium circumference. Extreme length of kernel is not essential to highest yield. The yields of two lots having kernels a little above, and a little below, average leugth were practically identical.

Uniformity, or a reasonable degree of trueness to the type determined upon, is quite essential to progress in corn improvement. It should include height and habit of growth of plants; height of ear, as well as size, shape, colour and indentation of kernels.

REDCLIFFE N. SALAMAN. **The Inheritance of Colour and other Characters in the Potato.** - - *Journal of Genetics*, Vol. I, No. 1, pp. 6-44, 20 pl. Cambridge, Nov. 1910. **81**

Great Britain

The present work possesses an interest and importance which can certainly not fail to be perceived by all those engaged in the problems of Mendelism. Its interest is from the purely biological point of view as regards the conception of a genotype and again from the practical point of view by the creation of new types of plants and animals.

The culture experiments with Potatoes (Sutton's Flourball, Congo, Lindsay's etuberosum), which the Author has carried out since 1906 at Barley, Hertfordshire, brought to light in this plant, which is so important in the husbandry of England and other countries, quite a series of true and genuine Mendelian characters. They form an excellent matierial for scientific investigations and for the rational improvement of cultures by selection and hybridisation.

1. The twist of the leaf axis in the Red Fir Apple is a recessive character.

On crossing the Red Fir Apple with the "Reading Russet" there are obtained in the F_2 (second generation) the following results (taking account only of the leaf characters):

Structure	« Reading Russet »	— Shape	« Reading Russet »	10	11
»	»	— »	intermediate	1	
»	intermediate	— »	« Reading Russet »	4	
»	»	— »	Intermediate	40	
»	»	— »	« Fir Apple »	12	
»	« Fir Apple »	— »	Intermediate	9	
»	»	— »	« Fir Apple »	42	

Total of plants of F_2 . . . 118
Twist of the leaf in 27

We have two perfectly recognisable characters: the "shape" of the Reading Russet and the "twist" of the Red Fir Apple. The intermediate form is much more similar to the Fir Apple than to the Reading Russet. Consequently we can regard the form of Fir Apple as a dominant character and the twist of the leaf as a recessive character.

2. The length of the tuber is a dominat character in relation to a rounded form.

3. The depth of the eyes is dominant in relation to shallowness.

4. The purple colour in the tubers is dominant as compared with the red.

The red and purple colour of the tubers is due to the presence of quite differerent pigments in the cell juice of the most superficial layers. It is likewise shown that, even in white tubers, some quantity of pigment however small, always exists.

5. *Solanum etuberosum* is not subject to the same laws of dominance as prevail in the varieties of the ordinary potato.

6. Among the specimens of *S. etuberosum* there are some at the present time which are immune against the attack of *Phytophthora infestans*.

7. This immunity against the attack of *Phytophthora* is a recessive character in *S. etuberosum*.

82 JOHN H. WILSON. **Experiments in Crossing Turnips.** — *Trans. of the Highland and Agric. Soc. of Scotland.* Vol. XXIII, pp. 18-23. Edinburgh, 1911.

United Kingdom

The yellow-fleshed and the white-fleshed turnips are distinguished from the Swedish turnip or swede by very distinct characters.

Swede and Turnip. — In turnips the substance of the "bulb" or swollen basal part of the plant is comparatively soft, but in swedes it is much firmer. The external coloration of the bulbs of turnips includes several shades of purple, green, and yellow. In swedes, purple and a greenish shade — the so called bronze — are the common colours. The leaves of turnips are bright pure green, and fairly hispid; and when the vegetative development is complete, they form a compact rosette at the apex of the bulb. The leaves of the swede, on the other hand, are bluish-green and glaucous, and at the period of crossing are at the top of an erect, short stem — the neck — which develops at the apex of the bulb in summer. During the reproductive phase of both turnips and swedes, which is reached in ordinary cultivation after a period of quiescense in winter, a tall apical stem — the axis of the inflorescense — arises, and branches freely.

The Swede Crossed with the Turnip. — Mr. Wilson has carried out many different crosses between swedes and turnips, and kept the results for several generations. In careful experimental work the bulbs have to be well grown one season, and in the following season the selected ones are seeded at places out of the reach of intercrossing by insects. It thus takes two seasons until the outcome of selection of individual bulbs can be known.

Number and Size of Seeds. — Only a few of the crosses effected will be dealt with in the present communication. The first one which it is proposed to discuss was between a purple-top swede and a yellow turnip, the swede being the seed-parent. The immediate effect of pollination seemed satisfactory enough, but it was noted that when the capsules were ripe the number of seeds in them was smaller than in capsules resulting from fertilisation of the swede by its own pollen. This circumstance pointed to constitutional incompatibility in the parental types. Further, the seeds in the crossed capsules, instead of reaching the normal size found in the swede, were distinctly smaller, being virtually like average turnip seed.

When the hybrid seedlings grew, the success of the experiment was soon evidenced by the new characters seen in the leaves and bulbs. The bulbs when lifted were found to be variable. Twelve of them resembled the yellow turnip closely, while six were purple-top. The neck, when present, was very short. In some the leaves resembled those of the turnip rather than those of the swede.

A matter of much significance was the presence of irregular swellings on the roots and at the bases of the bulbs of certain of the plants, these swellings bearing a considerable outward resemblance to finger-and-toe disease. Microscopic examination was not made of these excrescences, but it is certain, from observations made of similar growths which appeared in the later generations of the same cross, that they were not due to an attack of *Plasmo-*

diophora brassicae, the organism recognised as being the cause of finger-and-toe proper.

Two sets of the hybrid bulbs of this, the first generation, were selected for planting out, one set of four and the other of three, grouped in each case with respect to uniformity of character. In the former all the bulbs were yellow, and in the latter purple-top.

Flowers and Pollen. — The flowers of the hybrids were obviously intermediate in character. Microscopic examination of the pollen-grains disclosed the fact that a very large proportion of them were misshapen or abnormally small. On the other hand, a few of the grains were above the normal size, but they, too, were in all probability inferior. The abnormality of the pollen testified to the " violent " nature of the union, and a good yield of fruit was not to be expected.

In the middle of September the plants of both sets presented a remarkable appearance, being a mass of green, drooping twigs, still bearing much flower. The tallest of the set of four was 5 feet. The yield of capsules already ripe in that set was very indifferent, but at the date mentioned there were still numerous capsules ripening or quite green.

Selected seed was sown in ground where there was no suspicion of the presence of " finger-and-toe ". On the 4th of August, two of the progeny of the three plants were removed because of their poor growth, and they were found to be thoroughly deformed with nodules, recalling attack of finger-and-toe. In foliage many of this series resembled swedes more or less. A ew were distinctly like turnips. The intermediate character of most of the others was obvious in the light blue-green of the foliage. During the course of the autumn twenty-eight plants were removed, owing to their thoroughly diseased and weakened condition.

Nodular Disease. — That the serious deterioration in form of the bulbs of this second generation was not due to anything in the soil was quite patent, pure swedes side by side with them being as fine as could be wished. A few of the distinctly swede-like hybrids were good enough, but many of them had very long necks. The deterioration seemed to be largely due to the prevalence of the counterfeit finger-and-toe. But for the excrescences due to that ailment, many of the hybrids would probably have been shapely and attractive. Six green-top necked bulbs were specially noteworthy in this connection, being very large.

The disease which interfered so seriously with the experiment was, as already stated, not due to *Plasmodiophora brassicae*. In many cases the general malformation was very similar to the one caused by that parasite, but microscopic inspection failed to reveal an organism of any kind. In general, the greater the resemblance which the plant bore to a turnip, the more liable it was to malformation; but malformation was present, to some extent, even in plants which were to all appearance almost pure swedes. The same deformity has been quite a characteristic feature in other hybrids between swedes and turnips, and may be held to be simply attributable to constitutional weakness or derangement. The incompatibility existing in the parental forms, whatever it may be, finds expression in malformed growth of varying degree. The obvious violence of the cross must also receive full consideration, when an explanation of the deformity is sought for. The general conclusion reached from observations of the kind narrated above is, that the swede has a very different origin from the turnip, and that their affinity is by no means so close as many systematists imagine.

C. H. HOOPER. **Experiments in the Pollination and Setting of Fruit.** — *The Gardeners' Chronicle*, No. 1,293, Vol. L. pp. 254-255. London, October 7, 1911. 88

Great Britain

The writer gives a summary of experiments conducted during the season of 1911 on the pollination and setting of fruit. To test the effect of excluding bees from Strawberry blossoms, the box portion of a handlight was placed around a plant and muslin tied over the top; on other plants, single bunches of unopened flowers of several different varieties were placed in muslin bags, but in each case very little difference between the fruit of the enclosed flowers and those in the open was to be noticed; apparently the wind carries the pollen over the flower, as the ordinary Strawberries in cultivation set their fruits with pollen of the same flower.

In Raspberries and Loganberries, enclosed in muslin bags, the fruits set, but they were not quite as large or as perfectly formed as in the open.

In Gooseberries, and Red and White Currants, of which unopened blossoms were enclosed in muslin and paper bags, but few fruits set, and those apparently only where rubbed by the bags. In those bagged and hand-pollinated, the fruits of Gooseberries set fairly well, but as the blossoms open gradually, the flowers should have been pollinated several times. In Red Currants bagged and hand-pollinated, the fruits set quite as plentifully as in the open, and some of the berries were notably larger than the average.

The above mentioned fruits are self-fertile, and though all are benefited by the visits of bees, with Gooseberries and Red and Black Currants bees are absolutely necessary for the production of fruit.

The fruit trees, namely Apples, Pears, Plums and Cherries, may be divided into those varieties that are self-fertile and those that are self-sterile ; *i. e.*, those that will set and mature their fruits when pollinated with pollen of the same variety and those that will not.

In Pears, no fruit matured on 15 varieties which were bagged but not pollinated ; with those bagged and pollinated with their own pollen, Durondeau, Beurré Diel, General Todleben, Dr Jules Guyot, Josephine de Malines, and Marie Louise set fruits, but they gradually fell, last of all General Todleben ; the only two varieties which matured their fruit were Duchesse d'Angoulême and Colmar d'Eté.

Of Pears cross pollinated, good results were obtained with Vicar of Wink field with Winter Crasanne pollen, William's Bon Chrêtien with Duchesse d'Angoulême, Conference with General Todleben and vice versa. In Plums, trials were made with Victoria, Czar, Rivers's Early Prolific, Cox's Emperor, July Greengage, Greengage, Pond's Seedling, Bittern, Jefferson, Dennison's Superb, and Early Orleans; of those bagged and left untouched, only Victoria and Czar set and matured their fruit ; of those bagged and pollinated with their own pollen, only Victoria, Czar, Dennison's Superb, Bittern, and Rivers's Early Prolific matured their fruit. These varieties would therefore seem to be self-fertile, but most of them appear to set fruit more plentifully and bear larger fruits when pollinated with pollen of another variety. Mr. W. O. Backhouse, who has made trials with Rivers's Early Prolific on a large scale, finds it is the exception for this variety to set fruit when fertilized with its own pollen.

Of flowers that were cross-pollinated, good Plums were obtained on Pond's Seedling with Czar pollen, Rivers's Early Prolific with Victoria pollen, Victoria with Czar pollen, Dennison's Superb with River's Early Prolific pollen ; the pollinations were made without emasculation.

With Cherries, out of some nine different varieties, no variety set fruit when bagged and left untouched; when bagged and pollinated with their own pollen, only one variety, Florence, beside Morello set fruit, and it only bore one or two fruits ; Morello set nearly as well when pollinated with its own pollen as in the open.

In the cross pollinated Cherries, fruits set in each case, showing the necessity of visits of bees and the advisability of mixing different varieties of Cherries in a plantation.

Out of 63 varieties of Apples tried, on which unopened blossoms were bagged and left untouched, only Irish Peach matured its fruit, and that was very good ; of those bagged and pollinated with their own pollen by brush or anthers, the following matured their fruit: : Irish Peach, White Transparent, Newton Wonder, Ecklinville Seedling, Summer Golden Pippin, Baumann's Red Winter Reinette, Peasgood's Nonesuch, Christmas Pearmain, King of the Pippins (damaged by sawfly, eventually fell), and apparently American Mother and James Grieve. In nearly all the crosses made, good fruits have resulted ; out of 64 crosses, some 48 were successful ; among the best may be mentioned : - Brabant Bellefleur with Beauty of Bath pollen, Gladstone with Beauty of Bath, Alfriston with Beauty of Bath, Christmas Pearmain with Cox's Pomona, Mère de Ménage with Sandringham and Hormead Pearmain, Allington Pippin with Summer Golden Pippin, High Cannons with Grenadier, the Queen with Baumann's Red Winter Reinette, Lane's Prince Albert with The Queen, Cellini with Graham's Royal Jubilee. These crosses were made without taking out the stamens from the flowers, pollination being effected by brush or anthers ; if the brush was used, it was dipped in methylated spirits and allowed to dry before using again ; but in the case of a tree of Cox's Orange Pippin, nine bunches of unopened blossoms had their stamens taken out with forceps, and were pollinated by camel's hair brush or anthers with the pollen of nine different varieties of Apple, to try and see which would give the best result ; eight of these set fruit, namely, with High Cannons, Bramley's Seedling, Grenadier, Lady Henniker, Golden Spire, Duchess's Favourite, The Queen, and with its own pollen. In these trials only with Peasgood's Nonesuch did fruit not set. However, they have gradually fallen till the only ones left are those pollinated with High Cannons and Bramley's Seedling, the latter being one of the best fruits on the tree. It would be of interest and probably of value to find out a good polliniser to plant among Cox's Orange Pippin, which is a self-sterile variety, *i e.*, flowers self-pollinated will not mature fruit. One grower informed me that he found Worcester Pearmain a good variety to plant among Cox's Orange Pippin, and Mr. C. Martin, manager of the Toddington Orchard Co., in Gloucestershire, told me his best fruits of Cox's Orange Pippin came from a plantation interplanted with Duchess's Favourite.

Messers F. J. Chittenden, W. O. Backhouse, Little, and Avery have added valuable information, but we still need much investigation and observation of fruit-growers and economic botanists before we reach the knowledge already gained by American and Australian horticulturists as to which varieties to plant together.

84 WM. SAUNDERS. **Progress in the Breeding of Hardy Apples.** — *Bulletin No. 68, Experimental Farm, Department of Agriculture, Ottawa Canada*, pp. 14, illustrated.

Canada

This pamphlet, prepared by Dr. William Saunders, treats of the progress that has been made by himself during almost a quarter of a century in the breeding of hardy varieties of apples for the Canadian Northwest. A large number of hardy sorts brought from Northern Europe and other cold countries failed to fruit in the province for which they were imported. In 1887 seed was obtained from the Imperial Botanic Gardens, St. Petersburg, Russia, of a small Siberian crab apple, known as the "Berried Crab" (*Pyrus baccata*). Young trees raised from this seed bore fruit of a small acid character.

The next step was to improve the size and quality of the fruit by cross fertilizing the flowers of this sort with pollen from many of the hardiest and best sorts of apples grown in Canada.

In 1899 thirty-six of the cross-bred apples first produced and grown at Ottawa fruited and five of them were of such a size and quality as to justify their being propagated for more general test.

Since then several hundred more of these cross-bred apples have borne fruit and the number of varieties worthy of extended cultivation has been wonderfully increased.

Root grafts of some of the most promising sorts were early made and these planted on farms in the north western provinces have proved hardy. The pamphlet deals fully with the methods of the experiments and mentions and describes a large number of new named hybrid sorts that promise good results.

85 L. SAVASTANO and A. PAROZZANI. — **Some Natural Hybrids of Citrus Fruits.** (Di taluni ibridi naturali degli agrumi). — Estratto dagli *Annali della R. Stazione di Agrumicoltura e Frutticoltura*, Vol. I (1911), pp. 37-63. Acireale, 1911.

Italy

Out of about 200 varieties of citrus fruits described in various treatises on the subject, there are more than thirty hybrids. The frequency of natural hybrids among citruses is due to the great affinity (morphological and constitutional) existing between the different species, and to the abundant flowering, which in some species (Lemon) is continuous and very rich in nectar. Hence numerous visits by insects, particularly bees. Furthermore, seed plants are often allowed to grow without grafting, which gives the hybrid the opportunity to develop. Formerly citrus plants were left ungrafted more than to-day, and that is why hybrids were more frequent in the past.

The writers give a historical survey of the hybrids which have or have not been recognised by different writers from Ibn-al-Awan to Bonavia and living authors; he recalls the way in which they explain their origin, their systematic and morphological value. He then passes on to study some natural hybrids which he found in Sicily (Orange-Lemon, Lime-Orange and Lime-Lemon). For each hybrid he gives the bibliography, description and analysis (determination of acidity, reducing and non-reducing sugars). In all without exception analysis disclosed great fluctuations, both in acidity and in sugar, even for the different fruits of one and the same tree. The chemical variability therefore confirms the extreme morphological variability. On the other hand the common varieties of Orange, Lemon and Lime, which represent the progenitors of the three hybrids in question, gave uniform results under analysis, concording with morphological uniformity. Lastly in order to study the limits of variation in the fruits of a wild or nearly wild variety as compared with cultivated and improved varieties, the Writers, analysed the fruits of the Amboina Orange tree (*Aurantia acida* Rumphius=*Citrus fusca* Loureiro=*Acrumen Amboinicum* Gallesis), of which they found a fine specimen in the Catania Botanical Gardens. They obtained the same results as for the commercial varieties.

A table gives a recapitulatory comparison of the hybrids and varieties. It points to the conclusion that natural citrus hybrids present marked inconstancy of type; they therefore do not lend themselves to use as cultivated varieties. « That is why these hybrids, some of them centuries old, have not become an item of cultivation, but have remained curiosities almost neglected to-day ».

A coloured plate illustrates the Orange-Lemon and Lime-Orange.

A. D. Shamel. **A Study of the Improvement of Citrus Fruits through Bud Selection.** — *U. S. Department of Agriculture, Bureau of Plant Industry, Circular. No. 77*, pp. 1-19 + 5 figs. Washington, June 2, 1911. **86**

In April 1909, the Author was instructed by the direction of the Bureau of Plant Industry to make a systematic study of bud variations in the Citrus plantations in California. This is the variation phenomenon to which is due the want of uniformity frequently noted in individuals of the same type which have not grown under identical surrounding conditions, and which is manifested in the quality and

United States

quantity of the fruits, proportion of waste fruit, the characters of the leaves, etc.

The owner of a plantation of Pomelos in Sandiego County had noted that some plants in the same lot gave an inferior quality of product, while others of these plants yielded first-class fruits. He selected his buds from the latter exclusively and obtained excellent results in the new plantations.

This is a proof of what can be done with rational bud selection.

The Author began his work on the Orange variety " Washington Navel ", which is much esteemed in California for its uniformity of growth and production.

The two parent plants which were the first to be introduced into California are still growing in the neighbourhood of Riverside, so that the effects of environment on the progeny of these plants, plentifully dispersed under different climates and on different soils conld be studied in detail. The plantation where the experiments were conducted is situate on the estate of Eureka (Riverside, California) on clayey granitic soil; it consists of two lots of 50 individuals each, in 5 rows, regularly numbered and classified to prevent possible confusion.

As variable factors (meteorology) affect the crop, observations must cover at least 5 years. The data are recorded year by year on special forms. In each plant the number and weight of the fruits is noted proportionally to its size and according to the graduation proposed by the Author : (1) Orchard grade : perfect fruits ; (2) standard grade · inferior quality, but marketable ; (3) culls : unmarketable.

Each form also contains a general descrirption of the plant, the locality, the date of crop, name of the grower, and furthermore observations as to the appearance of fungi or insects, atmospheric changes, etc. Up to now no account has been taken of other characters, colour, flavour, etc., which are equally important from the commercial point of view.

The Author lays stress on completing the enquiries and extending them to the best varieties of Orange and Lemon Trees introduced latterly into California, and which have rapidly spread, without the precaution being taken of individually controlling and approving the parent plants.

CEREAL AND PULSE CROPS.

T. SILVA. **The Yielding Power of the first Generation of Wheats Grown away from their Place of Origin.** (La Capacità produttiva della prima Riproduzione dei frumenti originarii). — *Corriere del Villaggio*, Anno XXXI, No. 42, pp. 329-330. Milano, 15 Ottobre, 1911. 87

Professors Bellucci, Bendandi and Gennari undertook to determine by means of experiments, whether, in cultivating valuable varieties of wheat (the original production of which was confined to a given locality), in countries other than those in which the grain is indigenous, the productive faculty is retained in the first generation, and whether, and how, it diminishes in successive generations. The following tables show the results obtained: **Italy**

Experiments by Prof. Bellucci and Bendandi at Lugo (prov. of Ravenna).

	Varieties of grain	
	Gentil Rosso cwt. per ac.	Rieti cwt. per ac.
Original seed	18.86	20 58
1st Generation	15.61	19.55
2nd »	14 12	15.78
3rd »	13.20	12 35

Experiment by Dr. Gennari.

	Gentil Rosso cwt. per ac.	Rieti cwt per ac.
Original seed	24.06	19.44
1st Generation	23.60	18.97
2nd »	22.21	18.51
3rd » , ...	19.90	17.49

Experiments by Prof. Bellucci at Alfonsine (prov. of Ravenna).

	Gentil Rosso cwt. per ac.	Rieti cwt. per ac.
Original seed	21.80	15.49
1st Generation	17.08	14.97
2nd »	16.84	12.61

It is evident from the results of the above experiments that varieties of corn when reproduced in other than their native soil, degenerate and lose the greater part of the hardiness and productive faculty which characterizes and makes them valuable. But it is also evident from the above mentioned experiments that if the corn of a first reproduction be carefully selected, even by simple mechanical means, it is always found capable of considerable power of productivity. This being so, it will only be necessary, when once a given variety is introduced, to procure year by year a quantity of the original seed sufficient to produce the amount of wheat required for sowing all the fields of a farm in the following year. This will allow of a considerable saving of expense in procuring seed, as first hand wheat is sold at a much higher price than the common kinds.

88 G. W. Shaw and A. J. Gaumnitz. **California White Wheats.** (*Bulletin of the Experiment Station at Berkeley, California*). — *Modern Miller*. St Louis, Mo., September 23, 1911.

United States: California

California white wheats, as indicated by the names, are light colored as compared with eastern wheats; and further they produce a white flour. Some of these flours are nearly dead white, having practically no color value at all. Some samples have so little yellow that the lightest tinted yellow glass of the Lovibond tintometer is too yellow to match the flour. The Sonora variety, however, yields flour that has even more of the yellow color than the average eastern flour. The wheats most widely grown in California are Little Club (commonly called Salt Lake Club), White Australian, Washington Bluestem, Sonora and Propo. There are a few other varieties scattered here and there in the State, but the above-named varieties are the only ones which can be said to have a wide favor with farmers in the large wheat growing areas at the present time. Those of lesser importance are Golden Gate Club, Defiance and White Chile. It is impossible to obtain accurate information as to when these wheats were introduced into the State but doubtless most of them came from Australia. This is certainly true of White Australian and probably of Sonora, although the latter may have come by way of Mexico. The former is grown in Australia under the name of White Lammas. Sonora is also grown extensively in Australia under the name Velvet Pearl. Washington Bluestem is a strain closely related to White Australian, and is probably an Australian importation corresponding to the variety now grown there under the name of Purple Straw. White Chile was imported in the early fifties and if not the same is closely allied to Oregon Big Club. Propo wheat was probably imported from Chile. It was at one time held in high esteem by both farmers and millers. The latter still regard it highly as compared with the other California varieties, but growers have gradually drifted to one or another of those mentioned previously as giving greater returns in yield in the interior valleys. In the coast sections however Propo still holds its own and constitutes the bulk of the wheat there produced.

The analysis of the wheat and flour and the milling and baking tests for these white wheats, lead to the following conclusions :

The California white wheats have a low nitrogen and protein content ; the larger normal kernels usually carry a higher per cent of nitrogen than smaller normal kernels of the same type ; the white wheats are relatively high in fibre and low in ash and ether extract as compared with the hard winter wheats ; the wheat crop of 1905 contained a uniformly lower nitrogen content than did the crop of 1904 ; the overlap of gluten nitrogen in the salt soluble extract is represented in the case of white wheat meals by the factor 0.15 per cent ; for flour 0.22 per cent ; the polariscopic method for the determination of gliadin has proved reliable; the mechanical separation of gluten in the case of this class of wheats is unsatisfactory; the white wheats contain a larger proportion of their total protein in the form of gluten than do most other wheats ; the gliadin number of these wheats is much lower than for those of the Middle West ; these wheats ordinarily produce a white flour which bakes darker than the tinted flours from winter wheats ; the water absorption of these wheats is relatively low, the white wheat flour absorbs about 52 per cent, while the hard spring wheat flours absorb about 58 per cent; loaves showing the greater loss in baking, other things being equal; are the lighter and whiter ; glutens from white wheat flours are not tenacious according as they contain more gliadin ; the gluten of these wheats hydrolyses more than for other types of wheat ; the glutens of these wheats are usually inferior in quality and dull in color.

Utilisation of Sudan Dura Grain in Europe. — *Bulletin of the Imperial Institute*, Vol. IX, No. 3, pp. 253-259. London, 1911. 89

The material variously known as dura, dari or Kaffir corn, is the grain of the plant known botanically as *Sorghum vulgare* (1),

Europe.
Asia.
Africa

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(1) *Sorghum caffrorum* Beauv. = *S. vulgare*. (Cf. *Index Kewensis*, Vol. II, p. 949. Oxonii, MDCCCXCV). (*Ed.*).

which is widely cultivated in tropical and sub-tropical countries, where the grain is used by the natives as a food. The grain has also been imported to Europe in some quantity, and has been used chiefly as a feeding stuff for poultry and also as a raw material for the manufacture of spirit.

It is used in Europe a sa substitute for maize. So far, European supplies of dura have been derived principally from Asia Minor and India, but in recent years imports have also been received from the Union of South Africa, and the latest addition to the sources of supply is the Anglo-Egyptian Sudan.

The total exports from the Sudan last year were about 3 000 tons. The plant grows like a weed in the Sudan, and with increasing transport facilities and a greater desire on the part of the natives to engage in trade, there is every reason to suppose that a large increase in the amount of Sudan dura available for export will take place.

The Government of the Anglo-Egyptian Sudan is fully alive to the importance of finding new markets for dura. And at the present time arrangements are being made by the Imperial Institute for feeding trials with Sudan dura at various centres in this country, and for experiments with the grain as a raw material for the brewing and distilling industries

Feeding trials with Sudan dura were carried out in Austria. The object was to compare the value of Sudan dura with that of Hungarian maize for fattening oxen.

The results of the first trial made in Märisch Kroman show that there is no appreciable difference in the values of dura and maize as feeding stuffs, but it should be noted that no accurate record of the actual weight of food consumed by the animals, nor of the excrement, could be kept, and consequently the results are less trustworthy than those which could be obtained at a properly equipped experimental station.

In a second trial the object was to ascertain the relative yields of milk from cows fed with maize and Sudan dura respectively.

On replacing maize by dura, the milk-yield increased by 0.8 litres per head per day, whilst the percentage of fat remained almost unaltered.

It might still be urged that feeding with maize possibly induces larger increases in weight, but as far as the purpose of this particular trial is concerned, the conversion of feeding stuffs into milk is more profitable than its conversion into flesh and fat. Moreover, the feeding with dura was continued throughout June, and the condition of the cows for slaughter purposes was considered highly satisfactory.

The conclusion arrived at, therefore, is that dura is at least egual to maize as a feeding stuff.

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R. N. MAKIN. **The Production of Maize on the South Coast of N. S. W.** — *Agr. Gazette of New South Wales*, Vol. XXII, Part 9. Sydney, October 1911.

Australia
N. S. Wales

During the last three years the writer (inspector of Agriculture) has been watching the cultivation of maize on the South Coast with interest. Being under the impression that there was only a small monetary return from maize grown under systems in vogue on the coast, he has consulted some of the leading growers as to the cost of production.

The following estimates for labour and rent of land were obtained, the aveiage yield being in two cases 60 bushels and in two 50 bushels:

	£	s.	d.
Ploughing and harrowing	1	3	0
Planting	0	3	0
Seed	0	1	1
Scuffling	0	10	2
Pulling, husking and carting	1	5	10
Shelling	0	7	9
Bags	0	7	6
Rent of land	1	15	0
Tax on land	0	1	11
	£5	15	4

The average yield of 60 bushels per acre for the Bega district and 50 bushels for Shoalhaven is rather high in the writer's opinion, and in some cases the prices for labour were a little under prices ruling at present.

There is, of course, considerable variation in the estimates for the different items obtained from different sources.

Rent of land ranged from £1 10*s.* to £2 10*s.*

The maize crop should not, however be debited with the whole of the rent, as two crops should come off the paddock; but in most cases farmers do not adopt that practice. When the maize is pulled, cows are turned in to consume any feed that may be left, and later on the land is ploughed again for maize.

To complete these figures, cost of cartage to boat or train, and boat or train freight, etc. must be added. All of these put pence per bushel on to the cost, so that with the cost of production running out at about 27.44 *d.* per bushel as shown here, and the average market price being at 3*s.* there does not remain much of a balance to pay for the marketing, interest, insurance and depreciation of horses and machinery which should all be included in the cost of production. The writer says that in the United States, where maize-growing is carried out on an extensive scale, the cost of production runs from 14.6 cents to 30 cents per bushel, and that therefore it should not be impossible for the South Coast to produce the crop on a cheaper basis.

91 **The Supply of Cereals in China.** (Report of the Austrian Consul General in Shanghai). (Chinesische Getreideversorgung). — *Oesterreischische Monatschrift fur den Orient*, Nr. 119, pp. 164-165. Wien, November 1911.

China

It is generally believed in Europe that the sole food of the Chinese is rice, and that wheat forms no part of the diet of the Chinese population. Undoubtedly rice forms the principal food south of the Yangtse and in the zones contiguous to the north bank of that river, but when rice is dear, wheat becomes very importnt as an article of Chinese food. This is the case in the North of China, where wheat has been cultivated for centuries, the cold rendering rice growing impossible. Although there are no accurate statistics, it can be ascertained that in Central and Western China the wheat harvest is no less than 72 million hectolitres (nearly 200 million bushels). At the last harvest Shanghai and Schensi produced more than 18 million hectolitres (50 million bushels).

Nevertheless, as means of transport are deficient, it is almost imposible to distribute the wheat from province to province.

Manchuria produces more than 36 million hl. (100 million bu). Generally an increase of the area under wheat is observed ; in addition the number of mills of modern type is increasing ; there are 20 of these mills in North Manchuria, 14 in Shanghai and 6 at Hankow. In Shanghai, the mills form a very prosperous industry. They receive wheat from provinces as far away as Shantung and Honan, where the wheat growing undergoes continual expansion, chiefly by reason of the construction of a railway which facilitates transport.

Chinese wheat, however, is always full of defects, and is at times even wetted to increase its weight, so much so that when buying, 10 % of waste must always be allowed for.

In 1898, Shanghai for the first time exported wheat flour; in 1909 it already exported 1 334 763 piculs (1 picul = 133 pounds).

Nevertheless China is still importing flour, and in 1909 it imported 596,777 piculs. Still, the tendency is for China to become independent of both wheat and flour from abroad, in consequence of the continuous and progressive development of wheat cultivation and the milling industry.

Soy-Bean Culture in Ceylon. — *Journal of the Royal Society of Arts,* No. 3078, p. 19. London, Nov. 17, 1911. 92

Ceylon

The soy bean which has come into prominence recently, owing to its commercial value, has now been successfully experimented with in Ceylon. The Agricultural Society secured a large quantity of seed some time ago from the Far East, and experiments were carried out at the Botanic Gardens at Peradeniya, but the cultivation proved a failure.

The Secretary of the Ceylon Agricultural Society has now succeeded, however, in turning out a large crop in the Government stock gardens in Colombo, producing two varieties: the Japan (white seed) and the Java (black seed); seed will, it is said, be available for distribution shortly. It is expected that the cultivation of the soy bean will be taken up largely in Ceylon, for besides its value as an article of food it can be exported to the European and American markets.

The Virginia Peanut. — *American Agriculturist,* Vol. 88, No. 18, pp. 417-421. New York, October 28, 1911. 93

United States: Virginia

The development of peanut has been practically accomplished since 1900. The normal crop in Virginia is about 12 000 000 bushels yearly. The principal types of peanuts grown in Virginia are the bunch, runners and Spanish.

The bunch nuts grow close around the roots, the runners grow farther away from the stems. The Spanish nut is small, generally only two peas to the pod; it weighs heavier than the other varieties and is much richer in oil. The soil required is a sandy, friable one that will not bake or get hard on top after rain. Lime is an essential element for the crop.

Machinery is taking the place of hand labour in shucking or picking the nuts.

It is only by labour-saving machinery that the crop of 12 000 000 bushels in Virginia could possibly be planted, cultivated, dug and prepared for market.

ROOT CROPS.

94 W. A. ANDREWS. **Potato Raising in New Brunswick.** — *Farmers' Magazine* Vol. 3, No. 1, pp. 33-37. November 1911.

Canada: New ʾrunswick

Carleton on the Western border of New Brunswick is the banner county of the province for potato culture. In 1909 it had 8 786 acres of potatoes which yielded 128.3 bushels per acre. The entire province that year grew 6 067 276 bushels of potatoes on 47 744 acres. The year before an almost similar area produced nearly 9 000 000 bushels.

A crop rotation popular with potato growers, who are as a rule general farmers, is for a farm having 75 acres of crops, 12 acres of potatoes, 3 acres of roots for stock, 15 acres of grain, 15 acres of clover, 15 acres of second year grass and 15 acres of pasture. Under such a system about 1 200 barrels of potatoes are expected each year.

The manure purchased amounts to from 750 to 1 000 lbs. of commercial fertilizer per acre of potatoes. The cost of raising and harvesting the potatoes amounts to about $ 40 per acre which is about 40 cents per barrel.

The equipment employed on a well-managed New Brunswick farm consists of a potato planter, capable of planting from five to eight acres per day; a sprayer, and a digger. This equipment will handle up to twenty acres, and it has been figured out that the cost of this equipment for twenty acres averages about 55 cents a barrel on the crop raised.

On account of the cool moist climate and suitable soil the potatoes grown in New Brunswick are of high quality, being firm, good keepers, having a good flavour and possessing a high starch content. The crop is marketed in Boston, Ontario and Quebec, and in Cuba.

G. Menard. **A New Method of Covering Potato Clamps.** (Nouveau mode de conservation des Pommes de terre). *Journal d'Agriculture pratique*, 75e année, T. II, N° 47, p. 656. Paris, 23 Novembre, 1911. **95**

Germany

On many German farms, potatoes to be stored are treated as follows: Square pits are dug, of 3ft. 3in. side and 20in. depth, preferably in permeable soils; the potatoes, which should be reasonably clean, are then emptied in and piled up in the usual way.. They are then covered with small dead branches, which may be of fir, but are better of gorse or juniper, which prevent rats and mice making their way in; above these branches, sods of turf two or three inches in thickness, cut out with the spade, are placed, surface outwards, like tiles on a roof, being built up from the ground. All that is then needed, is a little earth to close up the cracks.

The top is left open for some time, to let the moisture escape easily, while the turf slabs required to cover it are kept ready in case of rain. When the potatoes are judged to be sufficiently dried, the clamp is closed in. If the turf sods are good, they can be made use of again partly, the following year; the branches are not lost, and can be used as fuel.

Owing to the layer of air enveloping the potatoes, frost is still less to be feared than with straw, which has the additional drawback of easily furnishing shelter to rats and mice and facilitating the entrance of rainwater through the many channels. It should be furthermore noted that in clayey alluvial soils the pits should never be so deep, and that it is even preferable in this case to keep the whole of the potatoes above the level of the ground; in any case more covering material is wanted.

where the following results were obtained from the crops of November, 2nd 1911 :

Varieties of lucerne	Dry fodder qls. per ha.	Dry fodder cwt. per ac.
Argentina Hungary Provence	66 49	59.5
Bologna	75.80	60.3
Turkestan	18.74	14.9

From this it is seen that the lucerne from Turkestan is markedly inferior in yield.

The conclusions drawn from the experiments made are the following :

1. The developement of the plant is slow during the early stages of vegetation ; then, in the succeeding stages of the first year's growth there is no noticeable difference from the other varieties. These observations confirm those made by Denaiffe in France.

2, There are different types of Turkestan lucerne : those with obovate leaflets and those with lanceolate leaflets; the obovate form of leaflet predominates.

3. The development of the leaves and their nutritive value, as well as the structure of the stem, etc., seem largely due to meteorological and climatic conditions. The characteristics of both the leaves and stems of individual plants vary considerably in a single field of lucerne.

4. In original samples, the reniform seeds predominate ; but in those grown in Italy there is a predominance of truncate ones. Hence the shape of the seed is an insufficient guide in distinguishing mixtures. Certain important characteristies may be mentioned, such as the rough surface of the seeds and the shiny appearance, slight at the most and sometimes imperceptible, of the integument. In consequence of the inconsiderable value of Turkestan lucerne, mixing of it with home-grown lucerne comes to be pure fraud.

From all investigations made, the writer concludes there is no doubt as to the superiority of home grown lucerne cultivated in soils of lower and middle altitudes. But he also thinks it worth while to continue studying the lucerne of Turkestan, from which excellent results may be obtained in regions similar, from a climatic point of view, to those where it originated. It can be recommended for cultivation in the meadows and pastures of the coldest heights of the Alps and Apennines.

LEIVA. **The Cultivation of Lucerne in Chile and Costa Rica.** (El cultivo de la alfalfa en la Republica de Chile). — *Boletin de Fomento,* No. 5 de 1911. San José. Costa Rica. 99

Chile: Costa Rica

Fodder plants are of extreme importance in Chile, and their cultivation plays a continually growing part in the regions where breeding predominates. The area under lucerne at the present day may be estimated at 350 000 or 400 000 ha. (865 000 to 1 000 000 ac) that is, more than one half of the cultivated lands of Chile. Usually lucerne is grown in irrigated soils ; it is however to some small extent also grown in dry soils retaining sufficient moisture in spring. In the cooler regions, instead of lucerne, white clover and red clover are grown. Every year about 1 300 000 qls. (130 000 tons) of lucerne hay are produced for export. The exports go mainly to Bolivia and Peru.

Costa Rica possesses a number of soils which, like the elavated parts of Cartago and the sides of all volcanoes for instance, would be very well adapted for artificial fodder growing.

Costa Rica should introduce new varieties of fodder plants and increase the extent of its permanent grass lands, in order to render cattle feeding uniform throughout the year.

This will result in an increased production of live stock by Costa Rica, which will be able to make itself independent of imports of live stock from neighbouring countries.

BRUMM. **Barbary Figs as Fodder.** (La forrajera ideal de los secanos). — *El Cultivador Moderno,* No. 30, pp. 14-16. Barcelona, Octubre de 1911. 100

North Africa. Central America

The Barbary Fig (*Opuntia Ficus, O. vulgaris* and, *Cactus*), which is also called Indian Fig, possesses very great value for cattle feeding in the dry Mediterranean countries and Central America.

From one hectare of Barbary Fig plants, 20 000 kg. of figs can be obtained. The work of preparation of the soil for planting the figs is very slight. In Spain and Africa it is grown for its fruit, in Italy and America for the green fodder. In America (Mexico and Central America) where rain is very infrequent, it would be almost impossible to breed any live-stock without the Indian Fig tree.

The celebrated Burbank Cactus, a spineless cactus, yields a fabulous production, and it is of priceless value as a cattle feed in dry countries.

FIBRE CROPS.

101 **Egyptian Cotton.** — *Journal of the Royal Society of Arts*, No. 3080, pp. 59-60. London, Dec. 1, 1911.

Egypt

Since 1910 attention has been drawn in Egypt to the gradual deterioration of the cotton crop. The chief causes of the falling off of the Egyptian crop have been stated by experts to be over-irrigation, exhaustion of the land, insufficiency of new, good seed and the gradual admixture of the crop with Hindi cotton, this being the name of an undesirable type of cotton with a short, weak fibre, that injures the high grade of Egyptian varieties by infesting them with hybrids. A Department of Agriculture was formed at Cairo, with a suitable staff, to study and deal with questions that have up till now been referred to the khedival Agricultural Society.

The new Department of Agriculture had signified to the farmers and peasant cultivators that it was quite ready to offer advice with regard to selection of seed or cultivation, but the good crop of last summer gave such a feeling of security that the fellah appears to have taken even less care than usual.

An invention has been perfected for the prevention of cotton-worm, a kiosk in the shape of a trap. In a demonstration given in a field near the Gaffaria Canal, a thousand moths were captured during one night.

To regulate the use of cotton-seed, a matter in which Egyptian farmers have been very careless, the Agricultural Department issues circulars to the heads of villages and government cashiers in the provinces, detailing the manner in which carefully - selected cotton - seed will be put on sale at the markets of the Egyptian Markets Company, and the facilities to be accorded to farmers in the payment of the price of such seed.

Now the long discussed plan of draining the Delta is being put in hand. By this means the subsoil water, resulting from the irrigation, will be drained off. The enormous cost of the undertaking has prevented the Government from taking up the matter before.

The general conclusion stated in a work published by Mr. Craig, Director of the Computation Office of the Survey Department, is that:

the rate of decrease is less in Upper Egypt than in Lower Egypt, but still the decrease exists there also. Part of the decrease in the general average yield for all Egypt may be accounted for by the lower average fertility of Upper Egypt; extension of cotton cultivation to poorer land in Lower Egypt may account for some of the decrease, but scarcely for all. None of these causes, however, will account for the fluctations about the fairly steady rate of decrease.

Change of rotation from one of three years to one of two years may also account for some of the decrease. The cultivation of cotton is probably less intensive now than fifteen years ago.

The value of the crop per head of the agricultural population has nearly doubled in fifteen years.

Cotton Growing in Sind. — *Bulletin of the Imperial Institute*, Vol. IX, No. 3, pp. 217-227. London, 1911. **102**

British India

Considerable attention has been given by the Department of Agriculture of the Bombay Presidency to the cultivation of exotic cottons in Sind. The earlier experiments were directed to the introduction of Egyptian varieties. During the last two years extensive trials have been made with long-stapled American Upland varieties.

Since 1908 Egyptian cotton has not been cultivated on the Jamrao, as in 1909 there was no water available in the early part of the Kharif season, and in 1910 it was decided to remodel part of the Canal in the following year. In 1912 the cultivation of Egyptian cotton will be renewed, with the advantage of the experience gained from the earlier trials. The Jamrao Canal area consists of about 700 000 acres, of which possibly 100 000 acres could be devoted each year to the cultivation of Egyptian cotton, but until the proposed perennial canals are in operation in Sind it is not likely that more than about 20 000 acres will be devoted to this staple.

Carefully selected average samples of Abassi and Mitafifi cotton have been forwarded to three leading Alexandria brokers during recent years. Their verdicts are very important and are all to the effect that the Mitafifi is of a good, strong and useful quality, but that the Abassi would never grade as such in the market.

The importance of Egyptian cotton in Sind is very great, as when the proposed perennial canals are made there will be a large area suitable for its cultivation. One of these canals is to command over 1 000 000 acres, and if the cultivation of a high-grade cotton is introduced on a practical scale it will go far to raise general cultivation to a much higher level than it is at present.

American Upland cotton of several varieties has been extensively tried during the last season, and promises to be successful.

At present the indigenous cotton is grown in parts of Hyderabad and in the Thar and Parkar Districts, but is practically unknown in Karachi, Larkana, Sukkur and the Upper Sind Frontier. The cotton area is about 300 000 acres out of a total cultivated area of about 5 000 000 acres. This area is capable of great expansion, either with the ordinary indigenous Sindhi variety, or possibly with some of the ordinary American Upland varieties.

The local Sindhi is a very short-stapled variety, and is all exported to the Continent and used for mixing with wool. It is hardy, prolific, and a quick grower.

The following is the report on nine samples of seed-cotton forwarded to the Imperial Institute for examination:

	Lint obtained by ginning:	
	%	grs. per 100 seeds
Egyptian Mitafifi	33.9	4.82
Egyptian Abassi	34.4	4.7
Sindhi native cotton	38.4	2.87
Triumph American Upland . . .	33.5	5.30
Peterkin » » . . .	35.2	3.73
Toole » » . . .	28.5	3.51
Allen's improved long-stapled American Upland.	35.7	3.77
Griffin American Upland	30.5	3.39
Black Rattler American Upland .	30.7	3.15

Cotton-Growing in Eritrea. — *Journal of the Royal Society of Arts.* No. 3077, p. 1144. London, Nov. 10, 1911.

As one of the aims of the Italian Government in the development of their African colony of Eritrea is the keen desire to give to the cotton industry, at present largely dependent on American cotton, a new, and what might be called "home" supply of the raw material, much importance is attached to the proposal to cultivate cotton on a large scale in Eritrea.

Investigations have proved that abont 90 000 acres can at present be utilised for such cultivation without any special preparation of the soil, and an additional 125 000 acres, if advantage be taken of the natural inundations.

With the construction of the hydraulic works, already studied and planed out, for the irrigation of the plains of Tessenei and the valley of the Barca, a much larger area can eventually be adapted for the growing of cotton.

It is estimated that the two areas are capable of producing 264 000 000 lbs. of cotton annually. A Milan concern, which holds a concession for the cultivation of cotton in Eritrea, has already two ginning plants in the colony — one at Agordat, and a less important one at Massowah. From abont 2 300 acres conceded to this company, a production of 2 200 000 lbs. was expected in 1911. This is not a notable quantity, but the small production is due largely to the cost of transportation.

The latter is the most important question in the economic development of the colony, and the Italian Government proposes to extend the present railway line from Massowah to Asmara as far as Keren, a farther distance of abont sixty miles. With this line in operation, the products of the valley of the Barca will be brought by rail to the port of Massowah in five days, instead of the eighteen days by camel as at present. It is believed that the extension will be built, and in operation, within the next two years.

HOLLAND. (*Trade Commissioner*). **Cotton Cultivation and Irrigation. Works in South Africa** (1). — *The Board of Trade Journal*, No. 776, p. 84. London, October 12, 1911. **104**

Union South Africa

An arrangement has been made between the Union Government, the East London Chamber of Commerce and the Town Council, whereby an area of 80 acres in the neighbourhood of East London is to be placed by the Government under cotton cultivation this season, as a practical demonstration of the possibilities of the cotton growing industry.

A large irrigation scheme is under consideration by the Water Board of Van-Rhynsdorp, in the western portion of the Cape Province. It is proposed to irrigate on a perennial basis, by means of a canal system fed from a higher weir with considerable storage capacity, as much land as possible on both banks of the Olifants river, and along the lower reaches of the Doorn and Hol rivers. The area commanded by the channels is estimated to be 6 580 morgen (abont 13 900 acres). The cost of the works is placed at £155 000.

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(1) Cf. *Bull.* Dec 1910, p. 253; and July 1911, No. 2117. (*Ed.*).

R. vinifera, *R. Gärtneri* and *R. Hookeri*. The bark of *Raphia Monbuttorum* has not yet been put on the market. It would be desirable to establish a domestic and native industry in the country of production itself, for the manufacture of woven fabrics, coverings, etc. from this species.

At the present time in Kamerun and especially in Dschang the women engage in farming. Owing to the introduction of manures and the plough, the labour of men will be required, and the women can thus undertake domestic industry.

In the Savanna, near the streams, is found a species of Palm tree known as *Phoenix spinosa*. The natives use it for making the stakes which prop up their huts. The wood of this Palm tree easily absorbs and retains colours

Now the question must be studied of the manufacture of straw hats with the leaves of this Palm tree.

The question likewise of turning to industrial account the produce of *Phoenix spinosa* is of importance, because it is certain that in the very near future agriculture will not suffice to feed the native population, and the need for the creation of some domestic industry will be more and more felt

SUGAR CROPS

109 EMILE SAILLARD. **The Sugar Beet in 1911.** (La Betterave en 1911). — *Journal d'Agriculture pratique*, 75e année, T. II, No. 44. Paris 2 Novembre 1911.

France. Bohemia

The Author compares this years's beets with those of previous years from the point of view of chemical composition.

a) *Nitrogenous contents of the Beets.*

	As % of Sugar			
	1907	1909	1910	1911
Total nitrogen	1.27	1.35	1.33	2.04
Amide and ammoniacal nitrogen	0.11	0.11	0.11	0.25
Injurious nitrogen	0.36	0.47	0.38	5.73
Albuminoid nitrogen	0.84	0.77	0.84	1.06
	As % of total nitrogen			
Amide and ammoniacal nitrogen	8.7	8.1	8.3	12.2
Injurious nitrogen	28.3	34.8	28.5	35.8
Albuminoid nitrogen	62.9	57.0	63.7	51.9

1. This year's beets contain more amide and ammoniacal nitrogen and more injurious or melassigenic nitrogen than the beets of previous years. This strong proportion of amide and ammoniacal nitrogen is evidenced in the factory by more or less considerable losses of alkalinity during evaporation and boiling.

2. The results of 1907, 1909 and 1910 brought out the fact that in beets containing the largest percentage of nitrogen in relation to sugar, the smallest proportion of albuminoid nitrogen per cent of total nitrogen was to be found. This year's results confirm that observation which had already been made in Bohemia. Conversely, the beets containing most nitrogen per cent. of sugar exhibited the highest proportion of injurious nitrogen per cent. of the total nitrogen. On this point again this year's results corroborate those of previous years.

b) Total percentage (sugar + water) in grammes.

From his observations on beets in previous years he also concludes that the total percentage (water + sugar) in grammes tends to diminish when the saccharine richness of the beet increases.

The results (in gms %) obtained this year with 6 samples are as follows:

	Nnmbers of Samples.					
	4	7	8	9	10	12
Sugar	16.3	15.5	16.5	17.4	19.8	15.5
Dry matter	25.6	24	25.3	24.92	28	24.54
Water	74.4	76	74.7	75.08	72	75.46
Water + Sugar	90.7	91.5	91.2	92.48	91.8	90.96

Therefore for beets containing 15.5 to 19.8 % of sugar, the total percentage (sugar + water) expressed in grammes varied between 90.7 and 92.48.

Some years ago, after the example of M. Aimé Girard, the Author had found the total of 94 % for beets with 13 and 14 % of sugar.

SCHANDER and RÜGGEBERG. **Sugar Beets in Culture Solutions.** (Zuckerrüben in Wasser-Kulturen). — *Zeitschrift des Vereins der deutschen Zucker-Industrie*, 670 Lieferung, pp. 969-974. Berlin, November 1911. **110**

Experiments were made at Bromberg in growing sugar-beets in nutritive solutions. The object was to determine which was the best of all the solutions tried by Pfeffer, Knop, Sachs, Tollens, Crome and Mayer. **Germany**

The beets, as well as maize, taken as control., developed uniformly in Tollens' solutions varying in concentration. The roots of the beets became rusted in the weaker solutions, whilst the maize gave signs of poisoning in the stronger ones. In the best-grown plant the leaves were 18 cm. long and the roots 26 cm. There were also cases of roots reaching a length of 55 cm., but the leaves were not proportionately developed.

In 1911 experiments were continued with three of Tollen's solutions; the best results were obtained by diluting every 10 cc. in a litre of distilled water.

The following are the results obtained (measured in cm.):

N°		Length of leaves	L. of roots	Diameter
11	April 27-Sept. 27	40	75	6.4
12	May 2-Sept. 28	52	66	7.8
14	May 2-Sept. 28	40	55	7.5

On October 25, beetroot No 14, when removed from the receptacle, showed the following characteristics ·

	Weight gm.	% of the gross weight	Dry matter		Ash		
			gm	% of the fresh weight	gm.	% of the fresh weight	% of the dry matter
Leaves	183.3	37.8	21.0	11.4	2.53	1.4	12.1
Bulbs	282.0	58.1	55.7	19.7	3.04	1.1	1.7
Roots	19.9	4.1	2.8	14.3	0.89	4.5	31.7
Total . . .	485.2	100.0	79.5		6.46		

The sugar-content of the bulb was 12.7 % of the fresh weight.

The natural apperance of the leaves of plants grown in solution was the same as that of plants grown in soil. At the same time the bulbs were shorter and more stunted.

The growing of beets in aqueous solutions is a subject still requiring further experiment, and more exact information will be obtainable when the difficulties hitherto enconntered in such experiments have been overcome.

L. KÜHLE. **Will there be Sufficient Seed of Sugar Beet for Sowing in the Spring of 1912 ?** (Wird zur Aussaat in kommenden Frühjahr genügend Zuckerrübensamen vorhanden sein ?). — *Centralblatt für Zuckerindustrie*, No. 7. Magdeburg, 11 Nov. 1911. **111**

The poor harvest of beet seed is a source of serious anxiety to sugar manufacturers and beet growers, Therefore the president of the Society for the Encouragement of Vegetable Production in Germany has thought advisable to call attention to the unusually developed germinative faculty of the beet seed gathered in 1911, a fact confirmed by repeated trials. **Germany**

Indeed in the majority of cases a kilogram of seed gives more than 100,000 seedlings, whilst as a rule in Magdeburg there are only 70,000 seedlings per kilogram of seed.

This enormous quantity of seedlings, due to the smallness of the « seeds » and to their extreme lightness, will undoubtedly make it possible to save 30 % at sowing-time.

Beet growers shonld remember this fact next spring, and in this way the quantity of seed required for production all over the world may be ensured.

A. HERKE. **Influence of an Abundant Nitrogenous Manuring on the Sugar Beet.** (Wirkung grosser Stickstoffgaben auf die Zuckerrübe. *Aus den Arbeiten der Kgl. Landesversuchsstation für Pflanzenbau in Magyarovàr.*) — *Oesterreichisch-Ungarische Zeitschrift für Zuckerindustrie und Landwirtschaft*, XL. J., 5. H., S. 669-679. Wien, 1911. **112**

The question of nitrogenous manure in the cultivation of sugar beet may be said not to be well defined as yet, at least as regards the composition of the soil.

For the elucidation of this question two series of experiments were set on foot in 1903 in the Royal Experimental Station for Agriculture at Magyaróvár. **Hungary**

The first comprises several tests in the open in different localities. The results obtained led to the conclusion that a nitrogenous manure in medium quantities may be applied without any disadvantage either as regards the nitrogenous contents of the beet or the grade of purity ; on the other hand an increase of crop was noted, unaccompanied by reduction of the sugar contents. Again, plentiful nitrogenous manure may be applied to soils very poor in humus or in nitrogen without injuring the quality of the beet. The influence of the different nitrogenous manures, nitrate of soda, calcium-cyanamide and sulphate of ammonia, varied according to local conditions. In any case, to increase the total crop, nitrate of soda is the most advisable.

The second series was arranged in concrete pots of 1 ½ cubic metres (53 cu. ft.) capacity, filled with soil very poor in humus and nitrogen (0.037 %), and treated in parallel sets as follows: without manure, and with 30 kilogrammes, 60 kg., 120 kg. and 180 kg. of nitrogen respectively per hectare (26.8, 53.6, 107.1, 160.7 lbs. per acre). The nitrogen was given in the form of nitrate, and there were further added 70 grammes of superphosphate and 30 grammes of potassic salts of 40 per cent strength per pot for the two years.

From the results obtained it may be concluded that: —

1. In sandy soils very poor in nitrogen, nitrogenous manure increases the sugar beet crop when a sufficiency of water is available; in this case the leaves increase in weight much more than the roots.

2. In these same soils a plentiful and even excessive nitrogenous manure does not cause a decline in the sugar contents; nevertheless the nitrogenous contents increase in a greater proportion, particularly injurious nitrogen, and consequently beets of inferior quality are obtained.

3. With a phosphate and potash manure, the nitrogen in beets grown in a soil poor in that element only increases from excessive nitrogenous manuring, while moderate and even somewhat heavy applications of nitrate of soda cause a rise in the sugar contents without detriment to the quality of the beet caused by a higher nitrogen content.

OIL CROPS.

118 **Production of Sesamum Seed.** — *Bulletin of the Imperial Institute.* Vol. IX, No. 3, pp. 259-272. London, 1911.

Europe: Asia: Africa: America

The sesamum seed of commerce is the product of an annual herbaceous plant, known botanically as *Sesamum indicum*. The sesamum plant flourishes in tropical and sub-tropical regions.

It succeeds in southern Europe on the shores of the Mediterranean; it is a common crop in most Asiatic countries, and in Africa is found both on the east and west coasts and also in the interior, It has been introduced to the new world and is cultivated in North, South, and Central America. Sesamum is generally grown on light and sandy soils.

The forecast of the Indian sesamum crop gave, in 1911, the total area as 4 754 000 acres, and the estimated yield was stated to be 421 900 tons.

In the United States, the seed is sown in drills 3 to 4 feet apart, and the plants are thinned to a distance of a foot apart in the rows. In the East Africa Protectorate sesamum is cultivated all along the coast belt, but it does not succeed in the highlands. In Egypt sesamum usually follows wheat, barley, beans or berseem, as a catch crop.

Sesamum seed is grown extensively both in European and Asiatic Turkey. Jaffa, Caiffa and S. Jean d'Acre export about 16 000 quintals: Tarsus, Smyrna, Gallipoli, Volo and Salonicca 550 quintals. (1) In French Indo-China the principal cultivation of sesamum is in Annam, — the exports are of abont 400 tons.

The following table gives the quantities of Chinese seed sent to the principal European ports receiving this product during 1909:

Rotterdam	cwts	690 640
Marseilles	»	404 660
Trieste	»	301 400
Genoa	»	242 500
Antwerp	»	230 560
Hamburg	»	177 470
Bremen	»	134 900

The United Kingdom, Japan, Canada, and the United States take practically no share in this trade.

The sesamum plant is grown extensively in Africa, more especially on the West Coast, in the Sudan and Egypt. Sesamum is largely grown in German East Africa for local use; the export in 1909 was of the value of £14 200.

In the Sudan sesamum is the most important oil-seed in cultivation. The value of the exports was in 1909 £ 63 066.

The produce of the West Coast of Africa is largely retained for local consumption, but there is a considerable export from French Guinea, amounting, to 783 metric quintals (78 tons) in 1909.

The total Mexican production amounts to 80 000 hectolitres, some of which is exported.

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(1) 1 Quintal = 220.46 lbs.

114 **Sunflower Growing in Hungary.** (La culture du Tournesol en Hongrie). — (Report of the French Consul). — *Feuille d'Informations du Ministère de l'Agriculture*, No. 44. Paris, 7 Nov. 1911.

The sunflower is grown in Hungary either as a main product or an accessory product, bordering fields of maize, potatoes, tobacco, beet, kitchen gardens, etc.

Hungary

In 1907 there were produced 23 165 quintals as the main growth and 140 770 quintals as an accessory product.

About one thousand quintals are exported per annum, the greater part being used for making oil cakes for horses, birds and poultry.

Its cultivation as a main article is carried on chiefly in the following Comitats .

Szabolcs	8023
Szatmár	3283
Szilágy	3853
Zemplén	1880
Barènya	1505
Pest	1205
Arad	800
Bihar	609
Udvárhély	500

There are in Hungary a number of oil factories, the most important being the « Bonigyar Telep » at Nyir-Bátor.

The Servians in Hungary make a fairly large use of this oil, which they press themselves by means of very primitive appliances.

115 **Chinese Tea-seed Oil** (1) — *Journal of the Royal Society of Arts*, No. 3076, Vol. LIX, pp. 1129-1130. London, Novem. 3, 1911.

China

Tea-seed oil is the name applied to an oil expressed from the seed of *Camellia Sasanqua*. This is not the tea-tree (*Camellia Thea*), nor can its leaves be used. It grows principally in Honan, but is found wherever the wood-oil tree grows. The seeds are gathered in October, and the extracted oil usually reaches the market in Hankow about the middle of winter. It is used by the Chinese as a cooking oil, and costs in the market from 31 shillings to 33 shillings per picul of 133 ½ lbs,

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(1) The Chinese tea planters are said to propagate *C Sasanqua* as a shelter for their tea plants This small-leaved species has sweetly-scented red flowers; the odour of which is supppsed to be communicated to the neighbouring tea leaves Sometimes, however, the planters pluck the leaves and even the petals of this species, and mix these with the tea in order to produce a favourite-scented mixture. All the *Camellia* seeds contain a useful sweet oil; the seeds of *C. drupifera*, however, yield the largest amount of oil. (Cf. G WATT, *A Dictionary of the Economic Products of India*, Vol II, p. 65. Calcutta, 1889). *Camellia Sasanqua* Thun. (= *C. oleifera* Abel; ? *Thea Sasanqua* Nois), found in China and Japan; the seeds contain 30-40 % of fat (known as Sasanqua oil or tea-seed oil, and composed of 75 % olein and 25 % stearin) and 10 % of saponin. Air dried seeds contain up to 60 % of oil. The leaves contain no caffein. (C. WEHMER, *Die Pflanzenstoffe*, p. 492. Jena, 1911). (*Ed.*).

Hankow's export of this oil to foreign countries and Chinese ports in 1909 was valued at £6 500 and during 1910 at £17 300.

VARIOUS CROPS.

Rubber, Cocoanuts, Coeffe and Sugar in the Federated Malay States. — *The Board of Trade Journal,* No. 778, p. 191. London, Oct. 26, 1911. **116**

Federated Malay States

A Supplement of the "Federated Malay States Government Gazette" publishes the following notices of the cultivation and production of rubber, cocoanuts, coffee and sugar in the Federated Malay States, in 1908, 1909 and 1910·

Rubber		1908	1909	1910
Estates	No	300	377	435
Acreage in possession	—	455 596	500 431	579 598
Acreage planted to 31 Dec.	—	168 048	195 953	245 774
Exports	lbs.	3 165 600	6 087 815	12 212 526

The area under cocoanuts in 1910 increased by 6 529 acres, as compared with 1909. The exports of this product rose in quantity from 104 469 pikuls (pikul = 133 ½ lbs) in 1909 to 125 770 in 1910.

The area under coffee increased from 5 885 acres in 1909 to 6475 in 1910.

The area under sugar cultivation showed a decrease from 7128 acres in 1909 to 3759 in 1910, and of this area 1405 acres were interplanted with rubber. In a short time there will be little or no sugar grown.

117 ADAMS (Brit. Vice-Cons. at La Paz). **Cultivation of Coffee, Cocoa and Sugar-Cane in Bolivia.** — *The Bourd of Trade Journal*, No. 782, p. 380. London, Nov. 23, 1911.

Bolivia

The most fertile regions of the Republic of Bolivia are the North-East aud the North-west, including a great part of the Department of La Paz, some portion of Chuquisaca and the Departments of Cochabamba, Santa Cruz and the Beni. This region includes the mountainous zone and also that of the plains. In the mountainous zone, cut by deep valleys, the perpetual snow line is at 5 000 metres (16 400 ft.). The region between 2 500 and 5 000 (1) metres in height is called the "puna" and produces very little, Valleys are met with between 1 600 and 2 500 metres high, and the Jungas, i, e., the slopes of the Cordillera Real where the tributary rivers of the Amazon spring forth, lie between 800 and 1 600 metres high. In the valleys and in the Jungas, coffee, cocoa, and sugar-cane are cultivated.

The centre of coffee cultivation is in the Jungas provinces of la Paz Department, and the coffee grown there is generally considered to be the best in quality. The province of Apolobamba of the same Department, and the provinces of Sara, Velasco, Chiquitos and Corvilleras, of the Department of Santa Cruz, produce a good second-class coffee. This product is also cultivated in the Department of Chuquisaca, but on a very small scale. The production of the Jungas provinces of La Paz, which is relatively small at present, could be considerably increased, but the cultivation of cocoa appears to be more in favour with the agriculturists of this region. Coffee is exported to Chile and Argentina.

The production of cocoa is much less than that of coffee. The best quality of cocoa is that grown in the province of Apolobamba. All the region is now abundantly supplied with cocoa plantations, some scattered, and others in large groups, which continue up to the banks of the river Madre de Dio.

As it can be grown over such a large district, it is thought that the production of cocoa is one of the most promising future industries of Bolivia.

The cultivation of sugar-cane is carried on in the Department of Santa Cruz. Only a part of this production is used in the manufacture of sugar, which, notwithstanding its good quality, cannot compete with foreign imported sugar in other parts of the country.

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(1) 1 metre = 3.2808 ft.

Sugar-cane is also cultivated to a certain extent in the province of Azero of the Department of Chuquisaca, the Jungas of La Paz Department, and in the provinces of Mizque, Totava and Chapare of the Department of Cochabamba.

All this production is employed in the manufacture of spirits and molasses.

Tea Cultivation in Russia. (La culture du Thé en Russie). — *Questions diplomatiques et coloniales,* No. 355, p. 710. Paris, 1 Decembre 1911. 118

About twenty-five years have passed since, in the southern parts of the Russian Black Sea Coast,, tea cultivation was entered upon. This cultivation has reached great development. In 1905 there were supplied to the market 122 983 pounds; in 1909 the amount of 152 377 pounds was reached. Out of the total quantity of tea produced for sale in 1909, 8807 pounds of superior quality tea were made, the manufacture of which was undertaken for the first time, the price being fixed at 2 roubles 40 copecks (5*s.* 1.4*d.*) per pound. In addition to this quality, there are four other kinds of tea of inferior quality and finally tea dust. **Russia**

There were manufactured in 1909.

112 165	pounds	of tea	of best	quality
48 320	»	»	» second	»
426	»	»	» third	»
12 951	»	»	» fourth	»
9 045	»	tea dust.		

There are now six special factories for preparing the tea.

C. Ravenna and V. Babini. **On the Formation of Alkaloids in Tobacco** (Contributo allo studio sulla formazione degli alcaloidi nel tabacco). — *Rendiconti Acc. dei Lincei,* Vol. XX, fasc. 8°, pp. 393-398. Rome, 15 ottobre 1911. 119

Ciamician and Ravenna (*Rendiconti,* 20, 1, 614, 1911) had already made some experiments on the formation of alkaloids in plants and especially in tobacco. They had discovered that by inoculating plants with certain nitrogenous substances and especially asparagin, the total quuntity of nicotine was increased. They had also ascertained that an increase could be obtained by inoculation with glucose or without any inoculation at all but simply by means of a traumatic lesion. **Italy**

The new experiments carried out by Ravenna and Babini confirm the action of glucose in the formation of the alkaloids of tobacco and determine the best conditions of production.

They grew fifty young tobacco plants, distributed in five groups of ten plants each. The first group was placed in a complete nutritive solution containing also 1 gramme of calcium nitrate per litre; the second in the same solution with calcium carbonate instead of the nitrate; the third as the second, but in darkness; and the fourth and fifth in the nutritive solution with the addition of 2 % of glucose, the fourth group being exposed to light and the fifth kept in the dark.

The plants grown in the light in a complete nutritive solution with the addition of glucose, produced the greatest quantity of nicotine.

120 PREISSECKER. **The Varieties of Tobacco cultivated in Dalmatia.** (Le razze culturali del Tabacco in Dalmazia). — *Bolletino tecnico della Coltivazione dei Tabacchi.* No. 5, pp. 283-294. Scafati, Sett, Ott. 1911.

Austria: Dalmatia

With the exception of Spalato, where the " Kir " and " Giubek " are still grown to a very small extent, the only varieties of Tobacco now grown in Dalmatia, are Dalmatian acclimatised hybrids, and particularly in the northern districts of Sinj and Spalato, the Herzegovina variety originating from Stolac, Drinovci and Trebinje.

The trials made at Gravosa, Imoskj, and Sinj, with cultures of original Sumatra seeds gave bad results, and they were immediately abandoned.

By way of study, the Government attempted to improve the degenerate products of Dalmatian tobacco plants by importing fresh Macedonian seed (Pursitschan), and propagating a strong variety formed spontaneously, and good in quality (hybrid-Vilenica) of the Brista Valley near Imoski ; by crossing and reinvigorating the strain between Macedonian varieties and original Herzegovina tobaccos, and finally by modifiying the method of preparing the seed.

It will not be long before the hybrid " Vilenica " loses all importance, because it is already surpassed as regards quality by the hybrid Giubek-Drinovci.

At Imoski, the crossings of Stolac and Drinovci with Kir and Giubek produced various hybrids, none equalling Drinovci-Kir in quality. Experiments made with Giubek crossed with Stolac and Drinovci, by the American method of producing the races by forced self-fertilisatiôn, showed that on the whole very good products can be obtained from all the series Drinovci × $Giubek^n$ or Giubek × $Drinovci^n$ × $Giubek^{(n+1)}$

In crossings of a Macedonian tobacco with a Herzegovina tobacco, the heigth and number of leaves in the hybrid constantly fall off, while the length and width of the leaves constantly increase.

A hybrid type of the constitution Dolac × $Giubek^n$ will be the best adapted for growing in the district of Sinj and will be acclimatised there.

PAOLINI. **Some Varieties of Tobacco in the District of Benevento.** (Alcune varietà di tabacco nel territorio di Benevento). — *Bollettino tecnico della Coltivazione dei Tabacchi*, No. 5. pp. 268-272 Scafati, Sett.-Ott. 1911. **121**

The « Kentucky », one of the varieties of tobacco cultivated in Benevento, has in that district assumed an external appearance more resembling the « Brazil » variety than « Kentucky » itself, owing to natural crossings and the influence of surroundings.

Italy:

The « Salento » is a local hybrid grown in order to secure a variety with a large quantity of leaf, chiefly intended for the manufacture of fine cut tobacco. It springs from the crossing of « Cattaro » and « Kentucky »; it was called « Salento » in memory of the country of origin of the « Cattaro » which is the Peninsula of Salento. « Cattaro » is the most luxuriant and the coarsest of all the varieties of *Nicotiana Tabacum*.

« Kentucky » is the most widely grown variety of tobacco.

The tobaccos cultivated in the Benevento region furnish a fresh proof of the importance of the part played by cross-fertilisation, as well as the environment, in determining varieties. From the practical point of view, the Benevento varieties show that when different varieties of tobacco are cultivated in the same region, crossings between them happen very readily : so much so that within a few years plants of the original type are no longer found in the plantations, but only plants with mixed characteristics which are true hybrids. For tobacco, this is a double disadvantage, from the technical and the fiscal point of view. A technical disadvantage, because the type of product sought after is not yielded, and a fiscal disadavantage because the « Regulations for the native cultivation of tobacco » prescribe that growers should cultivate a given variety, and the State Monopoly officers hardly know what to do sometimes when they are confronted with plants which do not present the features characteristic of the authorised variety.

To remedy these drawbacks it would be necessary either strictly to prevent cross fertilisation or to have frequent recourse to original seed or at least first reproduction seed.

At Benevento this latter system has been used for about two years and the results are fairly good.

122 **The Siamese Tobacco Industry.** — *Journal of the Royal Society of Arts*, No. 3080, pp. 61-62. Dec. 1, 1911.

Siam

In Siam Tobacco is produced most extensively in the Provinces of Petchaboon and Rajburi. In the first named province the chief tobacco region is Petchaboon Town. The leaf grown there is generally regarded as superior to that produced anywhere else in Siam.

The tobacco of Siam is of two qualities, strong and mild.

The chief markets are in Bangkok. Certain qualities of Siamese Tobacco were shipped to Cochin-China and to Hong-Kong during 1910. Most of it is consumed locally.

The soils usually selected as suitable for tobacco cultivation are of three kinds, namely, bamboo forest, scrub land and high grass land. The soil that is considered the best is sandy or black and yellowish loam. In the kind of soil in Petchaboon Province tobacco can be grown on the same area successively for twenty years without the need of fertilisers, while in Rajburi it can be grown successively only for three years at the most. Nursery grounds have to be dug to about nine inches in depth and well broken, and then prepared into raised beds three feet wide.

The seeds are sown broadcast on the beds, where some protection against the sun must also be provided Transplanting takes place when the shoots are nine inches high. The packing is either in bales made of large dried leaves, called " baitong ruong " or in bamboo crates.

123 L. ROSENTHALER **Greek Hemp.** (Sur le Chanvre grec). — (*Apoth. Ztg.*, 1911, p. 678). — *Journal de Pharmacie et Chimie*, Tome IV, N. 9. p. 413-415. Paris, 11 Nov. 1911.

Greece

Hemp growing for medicinal purposes is only practised over a small area in Greece; this lies at an altitude of 800 to 1.000 metres (2,600 to 3,300 ft.) in the environs of Tripolitza in the Peloponnesus. Attempts to grow medicinal hemp in the other regions of Greece failed, probably because the plants did not secrete sufficient resin, and were consequently wanting in the narcotic properties. Moreover this experience is similar to that obtained in growing Indian hemp.

Sowing takes place in February and March, and the crop in August when the seeds have ripened. The seed-bearing side stalks are cut, and after tying them up in bundles they are dried in the open air, which requires two or three months. The crop is afterwards cleaned by removing the stalks and the largest possible quantity of seed, which have a different use. The stalks are not used for the manufacture of tissue ; they are burnt, and the ash employed as manure.

The quantity of hemp harvested at Tripolitza in normal years amounts to 3-4 million kilogrammes; (1) last year itwas only eight to nine hundred thousand kilograms, the plantations having been injured by locusts. The whole of the quantity harvested is used for the manufacture of Hashish in Tripolitza, where there are factories with 80 to 100 workmen. The whole of the Hashish grown is exported, some to Europe, but the greater part to Egypt, where its importation is nevertheless strictly prohibited by law.

The Cane Industry of the South China Coast *Journal of the Royal Society of Arts.* No. 3076, Vol. LIX, pp. 1123-1124 London, Nov. 3, 1911. **124**

China: Indo-China

There is a considerable trade carried on between the South China coast and Europe and the United States, in fancy cane materials. In general the trade is divided into two classes· those known in China as simply " canes " or sometimes as " Tsinglee canes," and generally identified with the name " Tonkin sticks," and the " Annamite sticks," also known as " Partridge canes." The former are the well-known bamboos of the finer fishingrod trade, which are also used for canes, umbrella-handles, etc. The latter material is that peculiarly coloured cane with short sections, which has grains of dark colours running lengthwise, and a bulbous root, usually used as a handle; it is a heavy wood susceptible of high polish. The name of " partridge stick " arises from the beautiful variegated colour of the cane. The name " Annamite stick " comes from the country in which the canes were first produced for the market. At the present time, most of these come from Saigon and Indo-China. A considerable portion of the " Tsinglee cane " or " Tonkin stick " also comes from Indo-China, but at present the greater part is grown for the market in the delta lands of the Pearl River, between Hong-Kong and Canton. Of late, there has been an increasing demand for the " partridge canes " or " Annamite sticks ". These are a variety of bamboo which grows with a peculiarly swollen bulbous-like root, with a few smaller roots projecting from it. The cane is pulled, not cut. When first pulled, these small roots are removed, leaving the swollen end smooth; when properly dried the root takes a high polish. These canes have a dark brown colour generally, the colour running largely in lines up and down the cane. The value of a stick is determined by its diameter, its colour, the quantity of root, its length, and its degree of dryness. At the present time about 4 000 000 " partridge canes " and 25 000 000 " Tsinglee " or " Tonkin canes " are exported from Hong-Kong annually.

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(1) 1 kg. = 2.2046 lbs.

MARKET - GARDENING.

125 A. and E. G. CAMUS. **Botanical Study of Cultivated Mints.** (Étude Botanique des Menthes cultivées). — *Bull. Scient. et Indust. Roure Bertrand fils*, 3e Série, No. 4, pp. 3-37. Grasse, October 1911.

France

Several mints are cultivated for their essential oils, used for infusions, or for cooking purposes. In perfumery manufacture the demand is chiefly for essence of peppermint. The climate does not possess so great an influence as was attributed to it in the growth of this species. The most important point is the selection of the varieties and the method of culture. *Mentha piperita*, which yields the essence most in demand, is not a species: it is a hybrid plant resulting from the crossing of *M. viridis* and *M. aquatica*. Owing to the conditions of variation depending on the influence of either of the progenitors, and in consequence of the appearance of fixity of these variations, and also the very great variations in pubescence or villosity (dependent on surrounding conditions), botanists did not suspect the hybrid character of *M. piperita* and regarded cultivated varieties as species. On the other hand, likewise owing to confusion, different species are cultivated under the name of peppermint.

This study comprises a description, a list of synonyms, and a bibliography of *Mentha piperita* and its varieties. A brief description of the plants mistaken for this *Mentha*, and the anatomical study of *Mentha piperita*, and its kindred plants, complete the work.

According to the writers, there is no room for hesitation as to the identity of the progenitors. These progenitors however have each several varieties, and to indicate which varieties contributed to the creation of different forms of *Mentha piperita* would be to enter upon the field of hypothesis.

It chiefly results from this study that *M. piperita* differs from *M. aquatica* in the following: its stalk has collenchyma columns of different shape, with smaller air channels, fewer in number, the secreting hairs with single terminal cell are more abundant, and the covering hairs have thinner walls. It differs from *M. viridis* in the following: the cortex of the stalk is a less compact tissue, there are two median liberoligneous bundles in the petiole; the capitate hairs are more numerous on the stalk and the upper epidermis of the leaves; finally, the collenchyma is less developed in the midrib.

Among the cultivated varieties of mints, the cultivation of the variety called « Red Mint » is far more recent in France than that of genuine peppermint. The growers obtain it in certain soils where it would not be possible to grow true mint successfully, because the former is much more hardy than the latter. This hardiness enables the Red Mint to be cultivated for four or five consecutive years in the same field, while with genuine peppermint it is well known that after every two years growing must be interrupted to allow the soil to recover. The yield of essence from the two varieties differs to some extent. The red variety gives a higher yield, but the quality of the product is inferior. The comparative table of analyses contained in this study only indicates, however, in the case of Red Mint the presence of a large quantity of free mint and menthol, and a lesser quantity of combined menthol. Probably the inferior fragrancy of the odour of Red Mint must be attributed to these differences.

Cultivation of Lavender. — *Bull. Scient. Indus. Roure Bertrand fils,* 3^e^ Série, No. 4, pp. 51-53. Grasse, Oct. 1911. **126**

France

In France the production of essence of lavender has undergone a serious crisis from two principal causes.

The first is of a technical and economical kind, the second is chiefly commercial.

For the last ten years living has become dearer in the mountains and manual labour becomes more expensive as it gets rarer. The women are paid at so much the 100 kilos, and they will not agree to work unless the weight of flowers they can gather in a day brings a sufficient return. For this reason the practice of cutting the plants low down has been introduced ; this does harm to the next crop.

Besides this, lavender is only cut in places where it grows abundantly, everywhere else it is left, as no one will go to gather it.

It may be said that the quantity of essence is a third less than it was ten years ago, while the consumption has increased to a marked extent. Sales are no longer held at Grasse; manufacturers have set up places in the areas of cultivation, and the competition for raw material has further raised the prices. A diagram of the variations of the prices of lavender essence shows clearly the great fluctuations that have occurred.

The remedy for this situation will be found, above all, in the cultivation of this plant, but it is not sufficient that the question be studied from the agricultural point of view; it must be viewed in an industrial light and the methods of cultivation must be considered in connection with the sale price, which, while leaving a reasonable profit, should allow the trade to obtain a large and regular supply of the essence.

127 **The Rose Crop in the South of France.** (La Récolte des Roses du Midi de la France). — *Bulletin Scientifique et Industriel Roure Bertrand et Fils*, 3ᵉ série, N° 4, pp. 64-69. Grasse, Octobre 1911.

France

In 1909 and 1910, the rose bushes suffered from the frost, so the crops of these two years were much reduced.

Apart from this accidental cause many plantations had been neglected during the period of low prices, from 1903 to 1907.

This neglect has caused an immense diminution of the harvest. This year the outlook seemed to be pretty fair when, towards the end of April, a lowering of the temperature again destroyed some of the flowers. The loss may be estimated at 25 %. As usual, the sheltered plantations, in an advanced state of vegetation suffered most, while those situated in the coldest plains have not suffered, as the buds were not yet formed.

A crisis in the market took place which showed the necessity of cultivating roses in other districts of France so as to prevent, in future, the abnormally high prices from which the perfume industry has suffered. Experiments have been made, in order to acclimatise a new kind of rose, in Grasse.

The first trial was made on the « Rose à parfum de l'Hay » and in a large plantation the number of flowers obtained was remarkable, though less than in the North and Centre of France.

At Grasse, on account of the excessively hot and dry summers, the roses do not blossom a second time.

The "parfum de l'Hay" roses begin to blossom in April and continue till July. With regard to its essence this flower can never equal the "Rose de Mai" in delicacy or strength. The firm of Roure Bertand fils intends making new experiments with the "Roseraie of Hay" hybrid of *R. canina* and *R. Gallica*. But instead of trying to acclimatise new roses it would be preferable to try to increase the flower-bearing capacity of the Damask rose. Mr. Cochet-Cochet thinks the result may easily be obtained, and two crops a year ensured, by choosing rose trees which blossom twice a year and multiplying them.

This selection should be repeated for fifteen or twenty generations. Artificial crossing of the Damask rose and other free-blooming species might also be tried.

The Riviera Flower Trade (1). — (*La Tribune horticole*, 23 Octobre 1911). Abs. :— *The Gardeners' Chronicle*, N°. 1299, Vol. L. p. 358. London, November 18, 1911. **128**

France The statistics for the past year give the export of cut-flowers from Nice as 7500 metric tons, of the value of upwards of one million pounds sterling. Some 18 500 persons are employed in this trade in the environs of Nice.

FRUIT-GROWING.

T. IKEDA. **Propagation and Cultivation of Fruit Trees in Japan.** — *Journal of the Royal Horticultural Society*, Vol. XXXVII, Part 1, pp. 95-102. London, October 1911. **129**

Japan The methods of propagation of fruit trees by cuttings and grafting are well known in Japan Budding, however, has been brought into use only in recent times and its practice has successfully spread throughout the country. The following methods of grafting are most in use : 1) " Kiri-tsugi ", similar to the " crowngrafting " of Americans ; 2) In-arching or Grafting by approach (" Yobi-tsugi ") ; 3) Splice Grafting (" Sogi-tsugi ") ; 4) Side Grafting (" Hara-tsugi ") ; 5) Cleft Grafting (" Wari-tsugi ") ; 6) Cutting Grafting (" Sashi-tsugi " and 7) Root Grafting (" Ne-tsugi ").

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(1) Cf. *Bull.* Dec. 1910, p. 270. (*Ed.*).

Crabs and apples are propagated by grafting. Many kinds of stock are used, *e. g.*: — " Rin-Ki " (*Pyrus Malus* var. *tomentosa*), " Koringo " (*P. baccata* var. *mandshurica*), " Kaido " (*P. spectabilis*), " Inunashi " or " Yamanashi " (*P. Calleryama*), " Kozumi " (*P. Toringo*), Sand Pear (1) seedlings, Quince (*Cydonia vulgaris*), " Kwarin " (*Cydonia sinensis*), " Boke " (*C. japonica*).

Sand pears and pears are grafted on " Yamanashi ", Quince, " Koringo ", and " Kempo-nashi " (*Hovenia dulcis*) Quinces are propagated by layering, cuttings and grafting. " Yamanashi ", " Koringo ", Pear seedlings and Quinces are used as stocks.

Pomegranates are grown from cuttings, layers, inarching, cutting-grafting and root-grafting, and the same species is used as the stock.

" Kaki " or " Date plums " (*Diospyros Kaki*) are commonly propagated by grafting, layering, root-cutting, etc. " Shibukaki " an astringent variety, and a " Mamekaki " (*Diospyros Lotus*), are used as stocks, and seedlings of sweet varieties are also available. Loquats (*Eriobotrya Japonica*) are propagated by grafting. Cuttings and layers are also used. Loquats and Quince are used as stocks.

Citrous fruits are commonly propagated by grafting. Amongst them, fingered citrons (2) only propagate by cuttings in the open air. Trifoliate orange (*Citrus trifoliata*) and " Yuzu " (*Citrus medica* var. *acida*) are used as stocks. The former has a dwarfing effect on the scion, while the latter has no such influence.

Peaches and nectarines (3) are commonly propagated by grafting, wild peaches, peach seedlings, dwarf peach (" Amento ") and Japanese plums being used as stocks. Ume trees are commonly grafted on a wild species called " Yabai ", " Bungo-ume " and " Naniva " and another wild variety. Cherries are propagated by grafting, other means being rarely used. Wild cherry (*Prunus Pseudo-cerasus* var. *spontanea*), " Yoshino " (*P. Pseudo-cerasus* var.

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(1) *Pyrus sinensis* (L. H. BAILEY *Cyclopedia of American Horticulture*. London-New York). (*Ed.*).

(2) The so-called fingered Citron or Lemon is *Citrus medica* var. *digitata*, Risso; (or var. *chirocarpa*) in which the individual carpels of the fruit are separated near the apex (L. H. BAILEY, *ibid*. (*Ed.*).

(3) *Prunus persica* var. *laevis* Gray. (L. H. BAILEY, *ibid.*). (*Ed.*).

Sieboldii), " Higanzakura " (*P. Miqueliana*) and " Fujizakura " (*P. incisa*) are the common stocks. " Yusura " (*P. tomentosa*) and " Niva ume " (*P. japonica*) are propagated by division, cuttings and layers.

Jujube (*Zizyphus Jujuba*) is propagated by seeds, layers, division, and cuttings. Myricas are grown from seed, or by root-cuttings, layering, division and grafting. Chestnuts are propagated by seeds, inarching, side-grafting, cutting-grafting, and other means Wild chestnuts and common seedlings are used as stocks. Japanese walnuts (*Juglans Sieboldiana*) and Ginkgos are propagated by seeds. Torreyas are grafted by inarching on the wild species, but seedlings are often raised. " White Pines " (*Pinus koraiensis*) are grafted by inarching or cleft grafting upon wild-grown black pine (*P. Thunbergii*).

Vines have long been propagated by layering in the growing centres of Kai. Cuttings, division and grafting are also familiar methods. Propagation by means of " eyes " has lately been introduced from Europe. They are grafted on other grape cuttings, or on the wild grape (*Vitis Coignetiae*).

Mulberries are grown by division, layering, cuttings and grafting. Japanese gooseberries are propagated by suckers, cuttings, layers and divisions ; brambles by suckers and cuttings.

The process of " bagging " has been extensively adopted by Japanese growers as a preventive measure against insects and fungi. Bagging is mainly practised on peaches, pears and apples. Recently, the vine-growers of Kawachi and Kai have begun to adopt this method as a preventive against the mildew. In this case long bottomless bags covered inside with light sulphur paste are used. Trials made with Kaki fruits have proved conclusively that bagging is effective against premature dropping of the fruits due to insects and fungi.

The extensive irrigation system of the orchards is unknown in Japan, where the damp climate greatly reduces the necessity of irrigation in summer.

Cultivation and hoeing are done only by hand with small tools. Until recently night-soil, stable manure, litter and trimmings from the roadsides or meadows were exclusively used in manuring. In some parts large quantities of weeds and undergrowth are spread thickly beneath the trees to serve as manure. Sea-weed is also often employed. Chemical fertilizers have recently become familiar, and phosphates have proved effective on some kinds of fruits, while other kinds of fertilizers have not been much used. For citrous fruits an expert grower in the province of Kii is said to use common salt to enhance the keeping quality of oranges and mandarins. In the Experiment Station at Okitsu it has been verified that the application of alkali would markedly improve the quality of citrous fruits. The Japanese farmers are accustomed to use salt to date plums as a remedy against the premature dropping of the fruit. They bury empty salt packages, made of straw, near the roots, or tie the packages on the stems. Saline water is said to be often poured around the trees.

180 W. T. MACOUN. **The Development of Fruit Growing in Canada.** — *The O. A. C. Review*, Vol. 24, No. 1, pp. 21-26. October, 1911.

This paper deals only with fruit-growing in the provinces of Nova Scotia, Ontario and British Columbia.

Canada In Nova Scotia apple trees were planted early in the seventeenth century. Export of fruit did not commence until about fifty years ago. The average export of apples per year from 1880 to 1885 was a little less than 24 000 barrels, while from 1905 to 1910 the export by the province per year amounted to 482 298 barrels. The total crop of 1911 is estimated by the author, who is the Dominion Horticulturist, at 1 225 000 barrels. Besides apples, pears, plums, cherries and small fruit of excellent quality are largely grown, while grapes and peaches are produced in limited quantities.

Apple trees were planted in Ontario in 1705 by French missionaries. The first peach orchard was planted about fifty years ago, when the planting of small fruit for commercial purposes was also commenced. The latest census figures, those for 1901, give the following statistics: area in orchards, 298 347 acres: area in small fruits, 24 348 acres: area in vineyards, 11 390 acres: area in gardens, 57 982 acres. It is expected that the 14 087 936 fruit trees reported in 1901 will this year have reached 17 000 000. The apple crop in Ontario in 1901 was estimated at 13 631 264 bushels; of tree fruits 1 536 634 bushels; the crop of grapes 23 156 478 lbs; and the crop of small fruits 16 232 020 quarts. The figures for 1911 when reported are expected to greatly exceed these.

The first cultivated fruit trees in British Columbia are said to have been planted on Vancouver Island in 1849. With the advent of adequate transportation facilities, planting rapidly extended. In 1901 the area planted to fruit within the province is given as 6 000 acres, of which apple orchards occupied two-thirds. This has now been increased to about 100 000 acres, much of which is under irrigation. The crop of 1910 was estimated to have a value of $ 2 000 000.

The climate and soil are admirably suited to the production of fine apples, pears, plums and cherries, and in some districts to peaches and grapes as well.

W. A. CRAIK. **Apples from Annapolis.** — *Farmers' Magazine*, Vol. 3, N. 1, pp. 47-52. November, 1911. **181**

Nova Scotia

The Annapolis Valley covers an area some seventy miles long from east to west, and from five to eight miles wide, lying between two ranges of hills in the Province of Nova Scotia and running parallel with the south shore of the Bay of Fundy. The soil is of a sandy nature.

For thirty years apple shipments from the Annapolis Valley have grown. Of the crop of 1880, 24 250 barrels were shipped. The average shipment for the following decade was 63 333 barrels per year. During 1891-1901 it rose to 203 332 barrels and for the period 1901-1911 the average export per year amounted to 422 028 barrels. The output for the present season is expected to reach 1 500 000 barrels besides 80 000 consumed locally.

Growers extending the orchard areas usually plant their young trees in the rough soil, and wait a year or two before clearing away the stones, scrubby growth, etc. Usually hoed crops are grown while the trees are reaching the bearing age.

Trees are usually planted from 30 to 40 feet apart, but some plant closer in order to head the trees in and keep them low down, making the operations of pruning, spraying and picking easier and less costly.

The ground is frequently cultivated until the middle of July when mammoth red, crimson clover or hairy vetch is planted for a cover crop. In October the growth secured is ploughed under. Muriate of potash and phosphoric acid in some form are applied early in the season.

Before the leaves are out a spray, composed of one part concentrated solution of lime and sulphur to eleven or twelve parts of water is applied to destroy insect eggs and lichens. Four sprayings of lime-sulphur or Bordeaux mixture are given afterwards, the first as the buds burst, the second when seventy-five per cent of the blossoms have fallen, the third about two weeks later, and a fourth in the latter part of August. Pruning is done in winter before the sap ascends.

Twenty-two co-operative associations handle much of the fruit. Members take stock in the association. Warehouses are erected at convenient points and to these the apples are sent to be graded and packed. Each association has its own brand under which all fruit is shipped. After deducting expenses the revenue from sales is divided among the members according to the quantity and value of the fruit shipped.

Most of the fruit is shipped in barrels, but many growers pack in boxes. Apples thus packed are wrapped in paper and placed in uniform rows.

Much of the fruit is sent to Europe, but many shipments are sent to Western Canada. The proximity of the Valley to Halifax, the principal shipping point, renders refrigerator cars unnecessary. Thousands of barrels are being made to find markets in Brazil and other South American countries.

It has been computed that land bought twenty years ago for ten dollars per acre and planted in orchards is now worth one thousand dollars per acre.

182 GIORGIO GARVINI. **On the Variety of Golden Vine Cultivated in the Provinces of Ravenna and Ferrara.** (Sulla varietà dell'uva dorata coltivata nelle provincie di Ravenna e di Ferrara). — *Cattedra ambulante di agricoltura della provincia di Ravenna*, pp. 3-39. Ravenna, 1911.

taly

The author gives the geology and climate of the regions of Ravenna and Ferrara. He describes the golden vine « di bosco », comparing it with that cultivated in the plain of Romagna. He gives the results of analyses of the new wine made from the « di bosco » variety of the golden grape. He makes a study of the method of cultivation of the latter, the quantities of manure, of soil, and the amount of care necessary, as well as the physiological and parasitic diseases to which it may be liable. In the economic section of this work he points out the advantages to be derived from the cultivation of this variety in the sandy coast region of Ravenna, more especially in the valley of Comacchio.

In fact, besides the pine-woods and the « Andalusian navaceros », (a sort of gardens laid out in the sand-dunes) it might be possible to have remunerative vine-culture, producing excellent wine with a good market.

It is noticeable that the « di bosco » variety, from the point of view of culture and influence of climatic conditions, has great similarity to the « Cabernet » and « Pinot noir et gris » vines. One of its essential qualities consists in immunity from phylloxera.

The author thinks that the number of fishermen in the valley of Comacchio, who constantly poach to increase their scanty means, might cultivate it with great advantage.

183 **Vine Culture in Victoria.** (Report of the French Consul in Victoria). — *Bulletin de l'Office du Gouvernement Général de l'Algérie*, No. 23, p. 356. Paris, 1er Décembre 1911.

Australia

The vineyards of Victoria, covering an area of 9 307 hectares (23 000 acres), in 1910 produced 550 000 quintals (54 200 tons) of grapes, part of which, reserved for wine manufacture, yielded 991 941 gallons. The output of raisins showed a fairly large increase, namely 108 452 quintals (10 674 tons) against 81 465 quintals (8 018 tons) for the previous season.

The Victorian wines, which are consumed almost exclusively in England and New Zealand, improve year by year, thanks to advances in the methods of cultivating the vine and the processes of wine making. Nevertheless their cost price remains very high, and does not allow them to compete seriously with French production in the world's market, even if their quality and quantity made the endeavour possible.

Phylloxera, which, from 1906 to 1908, had wrought terrible havoc, is in process of disappearance; the Ministry of Agriculture imported for its own account, and sold at low prices to vine-growers, consolidated graftings of French origin, by means of which the vine plantations were restored. The district of Mildura, where almost the whole of the grapes for supplying sultanas, currants and other raisins are harvested, is at present completely free from the disease.

184 F. WORTMANN. **The Conditions of Vine Growing in Algeria.** (Die Weinbauverhältnisse in Algerien). - *Landw. Jahrb.*, XL Bd., Ergänzungsband II., S. 77-98. 1911.

Algeria

During the last fifty years there has been a great development of vine-growing in Algeria, about 161 000 ha. (398 000 acres) being now under this crop. The crop of 1909 yielded nearly 8 230 000 hl. (181 130 000 gallons). Only France, Italy, and Spain have a larger wine-production than this, while Austria has only about half the amount and Germany not much over a third (1908: 3 136 000 hl.).

As early as 1843 Trappist monks paid some attention to vine-cultivation, and in 1865 some White Friars planted the first large vineyards at Maison Carrée near Algiers.

By 1880 the exportation was already large; it is chiefly to France, the exports to that country being over 6 million hl. in 1909, as compared with 100 000 hl. to other countries.

The province of Oran has the largest area of vineyards; next come Algiers and Constantine . The vine region is the extensive plain between the Atlas and the sea. Extensive vine-cultivation begins close behind Algiers, and in the plain of Medjidscha it reaches a development nowhere equalled in Europe ; on the lower slopes of the Atlas it is only found here and there, because the soils lack humus and the slopes are apparently too hot and dry.

Besides native varieties, a number of French and Spanish black grapes are grown. The methods of cultivation also come from France, and the spur-pruning usual in the South of France is likewise practised. Eight shoots are left on each stock, and each of them bears at least two bunches. The rows are 2m. (6 ft. 6 in.) apart, and the stocks 1 m. (3 ft. 3 in.) apart in the rows. In vineyards very carefully attended to, Guyot's method is followed.

Owing to the large size of the vineyards only field-cultivation can be undertaken. The ploughs are drawn by four or six mules, one in front of the other, working along the rows. In districts of scanty rainfall, there are often arrangements for irrigation. To prevent any earth being carried away, holes are dug at regular intervals between the rows.

Labour appears not to be good. On the large holdings which predominate, native labour has to be used ; European overseers are necessary. In Oran there are also some Spanish immigrants who do vineyard work, besides many Spanish small holders.

The price of wine has fallen greatly in the last few decades ; in 1884 it was about 30 fr. the hectolitre (1*s.* 1*d.* the gallon), but it has now gone down to 18-20 fr. (8*d.* - 8½*d.*) As the quality does not vary much and is generally very good, the wine is often sold by unit per cent of alcohol ; at present this unit is sold at 1 fr. 60 to 1 fr. 70 (1*s.* 4*d.* to 1*s.* 5*d.*), so that a hectolitre with 12 units per cent of alcohol (at 1 fr. 60) will come to 19 fr. 20.

Algerian wine is very highly coloured, and is much used for blending ; as a true table-wine its alcohol content is too high. In its production there are many difficulties. For instance, the vintage takes place (even in September) with a mean temperature of 40° C. (104° F.), which may go up to 52° C. (125.6° F.) in "scirocco" weather. Consequently, there is great danger of souring ; or of fermentation ceasing at such a high temperature without any formation of acetic acid. For this reason special cooling-apparatus is installed in the cellars. The must has finished fermenting by ten or twelve days; it is then drawn off and heavily sulphured to prevent the formation of acetic acid ; then sold as soon as possible.

Pests and diseases are very prevalent on the vines in Algeria. *Oidium* and *Peronospora* occur particularly near the sea, the plains with drier soil being free from them. The "scirocco" does a great deal of damage everywhere; it does indeed destroy the fungus diseases, but at the same time dries up the leaves. Again, locusts not infrequently appear in such swarms that they devour even the bark of the stocks.

There is also a beetle, called *altise*, (*Haltica ampelophaga* Suér.), which often does serious damage; it occurs also in the vine districts of Southern Europe. It is treated by means of arsenic compounds, which are mixed with sugar-solution and sprayed on a few of the vines. The beetles readily eat the poison in this form. Numerous analyses have shown that there is no danger of arsenic getting into the wine by this means.

Phylloxera was first discovered in Algeria in 1885 and has spread widely in spite of the most thorough regulations for dealing with it. Only a few places (Tlemcem, Bel-Abbès, Saïda) are still only slighty attacked. In all other districts the use of American stocks is urged. The treatment against the phylloxera is carried on as long as possible, but when the attack becomes too bad American stocks are supplied free by the Government. The first experiments on growing grafted vines were made at Philippeville in 1891. By now the area under American vines is very large. In Constantine province the new method is almost exclusively followed; in Oran it is much less so, as the abundance of calcareous soils there necessitates a careful selection of stocks, and the cost of reconstitution is considerable.

At first a great many different stocks were used, as only experience could show which were the most suitable. Only forms of Rupestris and Berlandieri are used now. Rupestris du Lot does very well on soils without too much lime; the pure Berlandieri forms, on the other hand, can be grown on very calcareous soils; they bear very well, but the percentage of successful grafts is often very low, so that Berlandieri hybrids are now more generally used. Berlandieri × Riparia 420A is very valuable for Algeria. Chasselas × Berlandieri 41B answers very well for shallow limestone soils. Mourvèdre × Rupestris 1202 is useful for clay soils. In Oran, Riparia × Rupestris 3306 is used for damp soils, Riparia × Rupestris 3309 and 101^{14} for good deep soils; Riparia × Cordifolia 93^{5} is also used there, and is specially useful for withstanding heat and drought.

The grafted vines for new planting are chiefly brought from France. The Government has, indeed, started vinegrafting stations in various places, and provides courses in the subject; but the French vines seem to do better than those raised in the country. The Algerian climate is too hot for growing the American stocks well.

The wines from grafted vines are generally considered of very good quality, and are preferred by the trade to those from ungrafted vines.

185 **Chinese Pomelos, or Grape fruit.** — *Journal of the Royal Society of Arts.* No. 3076, Vol. LIX, pp. 1130. London, November 3, 1911.

China

Various kinds of pomelos are grown extensively in southern China, all of which vary more or less widely from the American grape fruit, although belonging to the same family. Those grown in Amoy are the largest, and are regarded by foreigners as the best produced in China. A smaller kind is grown in the Foochow district. The Amoy pomelos compare favourably with the American fruit in point of size; they are thick-skinned, comparatively juicy, but decidedly bitter. The Chinese themselves prefer the Kwangsi pomelo, which is smaller but sweeter.

186 **The Banana Industry of Santiago de Cuba.** -- *Journal of the Royal Society of Arts*, No. 3077, p. 1144. London, Nov. 10, 1911.

Cuba

The production of bananas is second in importance among the agricultural industries of Santiago de Cuba. There are three districts where bananas are grown for export. Saetia, on Nipe Bay; Saqua de Tanamo, on Tanamo Bay, and in the region about Baracoa. The plantings at Saetia and Saqua de Tanamo are on lowland along the valleys of the Jumuri and Tanamo Rivers. The soil is a deep loam, formed from the deposits of the rivers and streams flowing from the Mayari mountains on the south and from decomposed vegetation. At Baracoa, the plantings are in the valleys and on the mountain slopes. The soil is also a deep loam from a disintegration of the rocks and earlier vegetation. There has been a large decrease in banana growing for export during the last decade. Large areas devoted to that industry have been planted in sugar-cane, because greater returns are derived from land planted with cane, and because the fruit produced in Cuba cannot compete with that of Central America, the winters of Cuba being too cold and dry. All the bananas produced for export are sent to the United States.

(French Consular Report.). **The Exportation of Australasian Fruits in 1911.** (L'exportation des Fruits d'Australasie en 1911). — *Feuille d'Informations du Ministère de l'Agriculture.* No. 44. Paris, 7 Nov. 1911. 187

Australasia

The various states of the Australian Confederation, as well as New Zealand, export immense quantities of fruit annually and almost exclusively to the United Kingdom. The results of this export trade for the season just finished are given in the following table:

Whence exported	Number of cases exported		
	Apples	Pears	Grapes
Sydney	548	9	—
Melbourne	197 865	17365	—
Adelaide	24 849	4 928	—
Hobart	569 515	37 033	3 545
Fremantle	12 137	1 891	—
Albany	2 502	—	—
New Zealand	5 356	—	—

For exporting, the case is calculated to weigh 19 kilos (42 lb.) for apples; from 15-18 (33 to 40 lb.) for pears, and 11 (24 lb.) for grapes.

The principal receiving ports are London, Liverpool and Glasgow. Until the home-grown cherries, strawberries and apples come in on the British market, this is an easy outlet for Australian and New Zealand fruits, which are scarcely able to supply the demand. Tasmanian apples in particular are more and more in favour among the connoisseurs of the metropolis, and the trade promises to grow still more in the future. Australian growers have tried sending apples to America; without, however, the results they expected; for the Americans, as a matter of fact, store the surplus of their own native crop in frozen chambers from which they draw their supply till the next harvest.

FORESTRY.

188

G. Hatt. **An example of Afforestation in the French Vosges.** (Un exemple de boisement dans les Vosges françaises). — ***Annales** de la Science Agronomique Française et Etrangère,* 28 An., No. 4, pp. 243-247. Nancy-Paris, Octobre 1911). — *Journal Forestier Suisse,* 62 An., No. 11, pp. 210-213. Berne, Novembre 1911.

France

Re-afforestation is now in favour in the Hautes-Vosges. There are two main reasons for this, one of an economic and the other of an ethnographical character:

1. An increase in the price of timber, particularly small growth timber, which can be felled to advantage when 40 to 50 years old, for paper-making.

2. The desertion of husbandry and pasturage lands far from centres, at great altitudes (2 500 to 3 300 ft), in consequence of the migration of the agricultural population from the uplands to the villages and factories.

Mr. Hatt proposes to show, by means of an example, the advantages of afforesting communal properties in the region, most of them lying fallow or forming poor grazing ground.

By decree of the 10th September 1861, 85 hectares (210 acres) of communal lands were planted with wood in the course of 5 years; the young trees used were exclusively Norway Spruce, the most suitable species for such an altitude on exposed land. The operations of plantation were supplemented by replanting blanks. The wood in 1911 presented the appearance of regular pole wood, containing trunks 15 to 35 cm. (6 to 14 in.) in diameter.

The costs of afforestation amounted to 150 francs per hectare (£ 2.8*s* per acre), or for 85 hectares (210 ac.), in 1911, with capitalisation at 3 %, to 48 244 fr. (£ 1910. 13*s*). The value of the ground at 100 fr. per hectare (£ 1.12*s* p. ac), capitalised at 3 %, forms 32 163 fr. (£ 1 273 16*s*). Finally the management and supervision expenses at 2 fr. per hectare (8*d* per ac.) per annum capitalised, represent 16 169 fr. (£ 640 7*s*). Total of expenses in 1911, 96 576 francs (£ 3 824.16*s*). Mention should be made of the fact that there is part exemption from payment of taxes for 30 years.

The value of the produce realised in these young stocks capitalised at 3 % was, in 1911, 37 610 fr. (£ 1 489.10*s*).

According to the stock-taking in 1910, there were 91 088 trees of 20 cm. (7.9in.) in diameter and upwards, forming a present total bulk of 29 508 cub. m., or in round figures 30 000 cub. m. (106 000 cub. ft.) Estimated at the very moderate price of 12 fr. per cub. m. (2*s* 9*d* per 10 cub. ft.), its value is 360 000 fr. (£ 14 260.).

The value of the wooded soil including all wood of a diameter below 20 cm. is about 1 000 fr. per ha. (£ 16 per ac.), that is, for 85 hectares, 85 000 fr. (£ 3 370). The total of receipts amounts to 37 610 fr. (£ 1 489.10*s*), plus 360 000 fr., plus 85 000 fr., i. e. 482 610 fr. (£ 19 000 odd).

In addition to general advantages resulting from the afforestation of the lands in question, the pecuniary profit realised amounts to 482 610 fr., less 96 576 fr., equals 386 034 fr., which corresponds to 4 300 fr. per ha. (£ 68 16*s* per ac.). The sum of 386 034 fr. may be regarded as the proceeds of putting out at compound interest for 45 years a principal of 21 250 francs, equivalent to the value of the lands and the costs of afforestation. The rate of capitalisation at which this sum operated lies between 6 and 7 %.

45 years ago the yield at 3 % of communal pasture land, estimated at 100 fr. per ha. (£ 1.12*s* per ac.), was about 255 fr. per ha. (£ 4 per ac.) per annum. To-day the annual yield of wood products at the rate of 2 % of the stock in the inventory is 600 cub. m. (21 000 cub. ft.), representing a sum of 7 200 fr. (£ 285).

C. G. BATES. **Windbreaks: Their Influence and Value.** — *U. S. Department of Agriculture. Forest Service Bull.* 86, pp. 100 + pl. XX + dgrm. 35. Washington, 1911. **189**

The term "windbreak" may be applied to any object which serves as an obstacle to surface winds. Windbreaks may be divided according to the present study into three classes: 1) rows and hedgerows; 2) belts or shelter belts; 3) groves, or, in the most extensive case, forests. A belt usually consists of three rows or more, but its width is less than twice the maximum height of the trees.

In European countries the windbreak perhaps serves its greatest utility as a check upon drifting sands along the coast, especially in France. In the interior steppes of Russia windbreaks have been planted more or less extensively to protect fields from the desiccating winds of the region. In Schleswig-Holstein earth walls are thrown up, since forest trees cannot be made to grow there.

The lack of reliable information concerning the protective value of windbreaks, together with the now common argument that they do more harm than good, makes their study exceedingly important. The present study is concerned with the collection of data showing the effects of windbreaks upon field crops, and with calculations of their net value to the average farm of the United States Middle West. The economic importance of tree planting in this region can be realized only when it is known that there are, for example, in one township in Kansas, approximately 170 miles (263 km.) of windbreaks, mostly rows of osage orange (*Maclura Aurantiaca* Nutt.) with an average height of about 20 feet (6 m.). In a valley county of Nebraska, there are in one township about 22 miles (35 km.) of rows, belts and groves, mostly cottonwood, with an area of 425 acres (171 ha.) and an average heightof 55 feet (16 m.); on the uplands of the same state there are also in a single township approximately 40 miles (64 km.) of windbreaks. In Minnesota one township contains approximately 400 acres (161 ha.) of cottonwood and willow groves.

The U. S. Forest Service has conducted experiments to obtain a clear idea of the influence of windbreaks upon the atmospheric and soil conditions which affect the growth of plants. And since the need for windbreaks on the treeless plains of the United States Middle West is exceptionally great, and since a larger number of windbreaks, as shown, are there available for study within a comparatively small area, the States of Nebraska and Kansas were chosen as the chief field for the present researches. To eliminate the factors of slope and aspect from the experiments, they were made in a plain country, in which differences of topography do not figure prominently.

Some of the observations made relative to the United States, and most of the results obtained, may be extended to other countries, where windbreaks are of real benefit to the farmer and fruit grower.

The writer has determined the influences of windbreaks through the agency of physical factors. The amount of competition for sunlight and soil moisture has been measured ; the atmospheric conditions which affect crops at some distance from the trees have been studied ; and the various influences have been segregated and expressed quantitatively.

The conclusions to be derived from these researches, may be summarized as follows.

1. The zone of competition. In a narrow zone or belt adjacent to the trees there is competition which results unfavourably to the annual crops by reason of :

a) Loss of sunlight. This amounts to from 50 to 125 per cent of the light which might fall on an area as wide as the height of the trees. This loss is greatest in the case of north-south windbreaks. It is accompanied by a somewhat greater loss of crops on an area of about the same extent as the shadow, the increase arising from the inability of plants to form seed with a limited amount of light, which might be sufficient for vegetative growth. This shaded area should be utilized for forage crops, or for trees which are able to subsist on partial light.

b) Loss of moisture. A zone varying in width from one to five times the height of the trees is affected according to the species and situation. The width of the strip may be greatly reduced by cultivation. This loss of moisture may, in years of drought, result in a complete loss of annual crops in the zone affected. The damage to deep rooted crops need not be so great.

c) Temporary reduction of soil fertility. This accompanies and is due to the loss of moisture in the root zone.

2. The zone of windbreak protection. In the wider zone of windbreak influence the protection afforded results in a marked benefit to crops, because of the creation on a large scale of conditions similar to those which obtain in a hot house. These conditions, all of which result from the ability of the windbreak to check the circulation of air currents, are as follows :

a) Less wind movement. As a result there is less damage by lodging of grain, movement of soils, and uneven drift of snow.

b) Less evaporation. This results in the ultimate conservation of the moisture of the soil. In dry years this may mean a partial crop instead of a complete loss.

c) Greater heat during the hours of sunshine and lower air temperatures at night. In the aggregate this stimulates plant growth during the spring and summer The value of this factor in the season of 1908, on the north side alone, was more than sufficient to offset the damage due to shading, and left a net surplus equal to the yield of a strip from one to three times as wide as the height of the trees.

d) Less extreme cold at night, if the windbreak can serve the purpose of checking the evaporation of moisture from objects upon which it falls as rain, sleet, or snow. In such a case a benefit to blossoming fruit trees was obtained in 1908 which amounted to as much as 10 bushels per tree in the subsequent crop of apples.

e) A slight increase in the capacity of the air for moisture, because of its greater warmth in the daytime. This increase is not sufficient to increase evaporation where the wind has been checked.

The absolute value of any of these influences will increase with the degree of efficiency of the windbreak, and their total amount on any side of the windbreak will depend upon the direction, velocity, and desiccating power of the prevailing winds.

Before deciding what is the best form of windbreak, the actual timber value of the available species, and the comparative value of timber-lumber to be used as posts and as fuel produced in single rows, in belts, and in groves should be carefully measured. A large number of estimates of the products of different species — cottonwood, green ash, silver maple, honey locust, osage orange, Russian mulberry, catalpa, white and scotch pine — under various conditions have been made by the writer with such comparison in view.

140 A. Baldacci **The Chestnut in Illyria considered especially from the Point of View of the Trade in Telegraph Poles.** (Il Castagno nell'Illiria specialmente in rapporto al commercio dei pali per telegrafo). — *Bollettino quindicinale della Società degli agricoltori italiani*, Anno XVI, No. 21, p. 830-835. Roma, 15 Novembre 1911.

Austria: Illyria. Turkey. Montenegro

The writer indicates as new regions for growing chestnut, the geographical zone bordering the basin of the Scutari lake and generally Southern Albania to a distance of 19 to 25 miles from the Adriatic Sea.

In the Eastern Adriatic countries chestnut is to-day only found wild ; here, as everywhere, it is silicicolous and calcifugous, and in order to thrive, requires deep, cool soils formed by the decomposition of schists. The region studied being chiefly made up of limestone, the area covered by chestnut is limited (1). The chestnut generally thrives in places with west exposure.

The chestnut to-day still forms a stock of some considerable importance in the basin of the Scutari Lake ; nevertheless its importance was formerly much more considerable, perhaps because it was cultivated, while now it always grows wild. The chestnut is found, in the basin under consideration, sometimes on Montenegrin territory, sometimes in Albania, sometimes again on Turkish territory. The chestnut groves of the outlying spurs of the Albanian Alps might furnish thousands upon thousands of telegraph poles. Particulars and statistics relating to the extent and importance of chestnut groves in Turkish territory are wanting. From the Scutari lake, chestnut extends South-East in the country of the Mirdites and the Sandjakates of the Dibras and Elbasans, receding more and more from the sea.

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(1) See *Bull.* Aug.-Sept.-Oct 1911, No. 2682. (*Ed.*).

The Illyrian chestnut is not used locally except for making vine props, and beams in houses. As a nut tree it is quite unimportant.

Rubber Production in Southern Nigeria. — *The Board of Trade Journal*, No. 783, pp. 443-444. London, Nov. 30, 1911. 141

Southern Nigeria

An important stage in the development and improvement of the preparation of native rubber was reached during the course of 1910. Several thousands of trees in the native communal plantations of *Funtumia elastica* having attained tappable dimensions were tapped, and the rubber prepared under the supervision of and by members of the Forest Department in the presence of the owners. The coagulation of the latex was obtained by boiling, and the coagulum was then rolled out into thin biscuits on a table by a wooden roller, the rubber being washed throughout the operation with very hot water. The biscuits were then hung up to dry and smoked in a long drying shed. Rubber of the first quality was thus prepared by means of simple appliances that can easily be procured by the natives. There is a very great improvement on the usual quality of rubber exported from Southern Nigeria. As regards the yield, in all 1 022 lbs. of dry rubber were obtained from 4 706 trees over 18 ins. in girth, and from 28 815 small plants that were thinned out and tapped to death.

Rubber in Central America. (El Caoutchouc (Hule) en Centro America) — *Revista Economica*, No. 4, pp. 414-417. San José de Costa Rica, Sept. 1911. 142

Central America

Rubber is one of the principal articles of export in Central America; but the method of working is so primitive that the international market only allots a second rate value to Central American rubber. It is therefore entirely in the interest of the growers to adopt scientific and modern methods of tapping, because the price of rubber is continually rising.

The exportation of rubber is divided as follows from 1907 to 1909:

	1907 Kg.	1908 Kg.	1909 Kg.
Nicaragua . .	296 103	283 978	204 321
Guatemala . .	180 393	145 888	172 156
Costa-Rica . .	58 205	42 424	66 201
Honduras . .	44 577	35 227	37 579
Salvador . . .	30 158	24 611	30 280
Total .	609 436	532 128	510 537 (1)

This falling off in the production is naturally consequent upon the bad method of working practised by the natives.

Rubber estates should be farmed out to companies who would bind themselves every year to plant a given number of fresh rubber trees proportionate to the area worked.

As in the Belgian Congo, 500 rubber trees should be planted for every ton of rubber exported; the companies should also be bound to conform with the opinions of experts authorised by the Government, as regards the method of tapping and the planting of new trees. When concluding the contract, the Governments interested should see that all steps are taken to safeguard in every way the national economic interests of the State granting the concession.

148 BADERMANN. **The « Balata » Crop in British Guiana.** (Balata Gewinnung in Britisch-Guyana) *Gummi-Zeitung* No 5, p. 167. Berlin, 3. Nov. 1911.

British Guiana

In British Guiana, Balata (*Mimusops Balata*) is not worked on a very extensive scale, in the first place because the country possesses a large number of other resources, and in the second place because its working is difficult and troublesome from the point of view of the honesty of the workmen. There are no Balata plantations, and the work is confined to those trees which grow spontaneously. It is urgently necessary that the Government should take measures to prevent the Balata forests being damaged or badly worked.

Special concessions must be obtained from the Government for working the Balata. A variety of Balata growing very widely is the « Hyamallaba » which springs up in groups of 10 to 20.

Free working is carried on as follows. As soon as a pioneer has found a group of « Hyamallaba » he clears a belt one yard wide vound the claim, thus marking an area of 800 × 1,600 yards. The pioneer pays a tax of 9 dollars for each claim. Tapping is only done once a year on each tree; each tree thus gives from 5 to 8 pounds of Balata.

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(1) 1 kilog. = 2.2046 lbs.

The Indians are allowed to appropriate any gold they may find in the forests, and to cut wood free of charge, but they are explicitly prohibited from touching the Balata trees, except in order to protect them or prevent others from injuring them.

J. C. HARVEY. **A Mexican Plan for Tapping Castilloa** — *The India Rubber World*. New York, November 1, 1911. **144**

Mexico

In this article the writer illustrates with a sketch and describes a method that is believed to be an advance in the direction of tapping *Castilloa* with less excision of bark than is the general custom. The system contemplates operation on virgin trees, either wild or cultivated, such as have not already been scarred by any other plan, or no plan of tapping.

To make the application of this method as clear as possible it is assumed that a group of trees to be operated upon have a diameter of ten inches, or in round figures a circumference of thirty inches, and the height of the channels to be ten feet from base to upper end. A string can then be attached to a little peg driven into the bark at ten feet from the ground, drawn tight and fastened to another peg at the base of the tree, not immediately below it, but about one third of the way round the trunk. This cord should have a marked line drawn along it on the bark; in other words the bark must be marked with some pigment or colored chalk to serve as a guide for the tools, as extreme care should be exercised to have these channels correctly made. The excision need not exceed more than one half of the thickness of the bark.

Some difficulty may be experienced in the beginning with individual trees the latex of which may not be sufficiently fluid to run freely down the channel, but not more than in any other system; rather less indeed, since the angle is but a few degrees of inclination from the perpendicular. This plan provides for three of these nearly perpendicular channels to be made, not at once but at intervals of three or four months, perhaps longer, according to the vigor and size of the tree. The chisel incisions are made in strictly perpendicular series, and the incline of the long channel is sufficient to catch and guide the latex to the receptacle at the base. In establishing the long channels it was said that the excision need not to be made more than half the thickness of the bark. When such latex as may be secured is free from the channel, the knife or cutting point can then be run down the centre of the channel, lightly touching the cambium, when a much increased flow will be had; most V or U-shaped knives for tapping Castilloa have a fine penknife-like attachment to run down the centre of the excision made by the first operation.

After a proper lapse of time the chisel operation is then worked and no further excision of bark occurs. One great advantage of the slightly inclined long channel is that less proportion of bark is removed than with the strictly perpendicular channel with the lateral transverse contributing channels; moreover the growth of new bark is in almost uniform line with the expansion of the tree trunk, and the transverse excrescences are done away with. This method is not offered as a final solution of the problem of tapping Castilloa, says the writer, but it is believed to be in the line of progress.

145 The Production of Vegetable Ivory in Ecuador. — *Journal of the Royal Society of Arts.* Vol. LIX, N. 3076, pp. 1122-1123. London, Nov. 3, 1911.

Ecuador

An important industry in Ecuador lies in the export of vegetable ivory. The Spanish name is " coroza (1) ", but another similar nut is sometimes confused under the same designation. The fruit of the " tagua palm " furnished this article of commerce, which has proved to be an excellent substitute for the elephant tusk product, and has been found useful in other ways. The tree — growing from 10 to 20 feet high — grows wild along the west coast of South America, from Panama, through Colombia, Ecuador and Peru. The fruits, of which there are from 4 to 9 on the tree, weigh nearly 20 lbs. are about the size of a man's head, and consist of a woody, fibrous, wart-covered wall, enclosing the seeds proper; these are of a hard white composition, small potato sized, fine grained, and much like real ivory in characteristics. The head holds from 6 to 9 seeds. The seeds, when very young, contain a clear insipid fluid, but like the cocoanut, this liquid quickly becomes milky and sweet flavoured, and then the small native animals find it most appetising, As climate affects the development of the tree, so a considerable variation will be found in the form and composition of the tagua nuts that grow under. conditions of excessive rainfall, and those gathered in the drier climates. The time of bearing is about the sixth year and the life of the tree is estimated at from 50 to 100 years. Natives gather the fruit of the tree, taking those nuts found on the ground which are matured Immature seeds have a soft spot in the centre, which makes them less valuable. The principal use of vegetable ivory is the manufacture of buttons. Some vegetable ivory is used in making umbrella handles, chessmen, card counters, etc. Turning out ivory buttons is an industry that gives employment to many persons in Europe and the United States. The average annual export of vegetable ivory from Ecuador is 20 000 tons. Colombia has a fair share of the trade, with yearly increasing exports from Cartagena and Savanilla Although in recent years a limited amount of this product has been sent out of Africa, yet the real home of the " tagua palm " is Central and South America, where it is a considerable source of wealth to the countries producing it (1).

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(1) « Corozo de los Marranos » = *Cocos butyracea* L., « Corozo de Nueva Grenada » = *Elaeis melanococca* Gaertn.; « Corozo del Orinoco » = *Martinezia caryotaefolia* H. B. and Kunth.; « Corozo de Venezuela » = *Acrocomia sclerocarpa* Mart. M. COLMEIRO *Diccionario de los diversos nombres vulgarcs de muchas plantas*, etc., p. 64. Madrid, 1871) Another local name for *Acrocomia sclerocarpa* is « gru gru palm » (BAILEY *Cyclopedia of American Horticulture*, Vol. I, p. 20. New York, 1909). (*Ed.*).

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(1) The name of « corozo » is given in general to seeds which furnish vegetable ivory, such as *Phytelaphas macrocarpa, Sagus amicarum* (Tahiti nut), and *Hyphaene tebaica* (Dum palm). The amount of vegetable ivoryan nually imported into Europe is estimated at 10 million kg (nearly 10 000 tons) GUYOT-RAFFALOVICH, *Dictionnaire du Commerce, de l' Industrie, et de la Banque,* Tome I, p. 1067 ; T. II, p. 532. Paris, n. d.

The fruits described above are those of *Phytelephas*. cf. *Bull.* Aug.-Sept.-Oct. 1911, No. 2714. (*Ed.*).

LIVE STOCK AND BREEDING

HYGIENE OF LIVE-STOCK.

146 W. F. COOPER and G. A. FREAK. **Oxidation of Arsenites to Arsenates in Cattle-dipping Tanks.** — *The Journal of Agricultural Science*, Vol. IV., Part. 2, pp. 177-181. Cambridge, October (November 11), 1911.

Australia: Queensland

In countries possessing warm climates — U. S. A., South America, South Africa, Queensland, et. — where cattle raising forms one of the chief industries, it is necessary to immerse the cattle periodically in a bath containing sodium arsenite as one of its chief constituents. Hence, the question of oxidation of the arsenites to the less useful arsenates is one of great importance. Brünnich showed that this oxidation was accelerated by the presence of tar products; and further, that Stockholm tar induced oxidation more readily than carbolic acids. (1) This latter fact has such an important bearing on the composition of an ideal dipping fluid that the authors considered it desirable to compare in the laboratory the relative effects of wood or Stockholm tar and commercial cresylic acids.

For this purpose, solutions of sodium arsenite containing the tar products emulsified by means of soap, were placed in bottles, and air was drawn through them for prolonged periods. From the analysis, Brünnich's results as to oxidation of arsenites to arsenates are confirmed, the reaction having taken place in the presence of wood tar and also of cresylic acids. The oxidation however, in presence of wood tar is considerably greater than that which occurs in the case of cresylic acids. This result is of great importance, in view of the fact that Stockholm tar forms a large proportion of the Queensland Government Official Dip, which is claimed to be superior to any other mixture.

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(1) Australian Association for the Advancement of Science, 1909.
(*Author's Note*).

In further experiments, which were conducted by the Authors with the solutions exposed to direct sunlight, the extent of oxidation was very much greater. Doubtless in hot countries, the oxidation due to the high actinic power of the sunlight would be even greater; and it is in such countries that regular dipping of cattle is so essential.

However, until definite analytical figures, relating to freshly filled tanks and also to those which have been in use for varying periods, can be obtained, the extent of oxidation in a dipping tank can only be surmised: but these experiments confirm Brunnich's work and emphasise its importance.

In fact the concentration of arsenious oxide in a bath must be above a certain limit in order to be effective. If a standard has been fixed, as by the Queensland Government, and the arsenite were oxidized to arsenate, the strength of arsenious oxide may be reduced below the limit necessary for the successful destruction of ticks. And, if the number of cattle passing through a bath is taken into consideration, such an amount of oxidation is quite feasible, for each animal makes a great splash as it enters the bath, so that the wash is effectively stirred and exposed to the atmosphere.

In conclusion, this paper emphasises the need for official periodic analysis of dipping baths contents in all countries, as it is insisted upon in Queensland, if dipping is to be efficient. Neglect of this precaution would result in a sense of false security and to a disbelief in the efficacy of dipping as a means of tick eradication.

ANATOMY AND PHYSIOLOGY.

Dr. HESSE. **Functional Adaptation in the Animal Kingdom and its Relation with Heredity.** (Ueber funktionelle Anpassung im Tierreich und ihre Beziehungen zur Vererbung). — *Deutsche Landwirtschaftliche Tierzucht*, 15 J, Nr. 47, S. 561-565. Hannover, 24 November 1911. **147**

Germany

The term " functional adaptation " is applied by Roux to cases in which the structure and form of an organ become modified owing to increased use, in such a way that its capacity for this use is increased.

By " functional hypertrophy " is meant an increase in the volume of the organ owing to excessive use. Lack of use leads to " atrophy due to disuse ".

Cases of functional adaptation of external muscles are well known. The heart also increases owing to increased activity, as shown by Külbs with dogs. In men, hypertrophy of the heart may occur from great exertion, as in the case of athletes; also owing to a great increase of the liquid constituents of the blood, as in the case of heavy drinkers (" Bierherz ").

In certain diseased conditions, such as contraction of the aorta, and pulmonary emphysema, the heart has to perform extra work; in the former case the increased resistance takes place in the circulatory system, so that hypertrophy of the left ventricle results; in the latter case the right ventricle has the extra work and becomes enlarged.

This adaptability of the heart occurs in all vertebrates. Fish use very little energy for their movements; in herbivorous species the weight of the heart does not exceed 1 per thousand of the total body-weight. In birds, the weight of the heart is very large; in the hobby for instance 1.7 % of the body-weight. In the sluggish salamander it is .186 %, and in the wood mouse .716 %. Tame ducks have a smaller heart-weight than wild ones, and there is the same difference between tame and wild rabbits.

The length of the muscles shows similar differences. Marey has remarked that the calf-muscles of negroes are longer and thinner than those of white men; but the walking-powers of the two races do not differ; the difference is due to the greater length in negroes of the heel-bone to which the tendon of this muscle is attached. The heel-bone acts as a lever during walking: in the negro, the haft of this lever is long, so that to act properly it requires a long muscle capable of considerable contraction. Marey made an interesting experiment on a rabbit: he removed half the heel-bone and joined the Achilles tendon to the remaining part; after a year the peronaeus was a good deal shorter, as judged by comparison with a normal rabbit. Thus, the peronaeus can adapt itself to the length of the lever it works.

Bones also react to external stimuli. It has been found that in right- and left-handed people respectively, the weight of the bones of the right and left arm exceeds that of the bones of the opposite arm. In spongy bones the lamellae adapt themselves exactly to the direction of the pressure exerted on them; if the direction changes, as for instance, after a faulty knitting of a fractured bone, the lamellae also shift, so as to be in line with the force exerted.

The skin often reacts to external pressure, forming thickened areas. Babák has shown that when salamander larvae are placed in boiled water, poor in oxygen, the size of their gills increases; if they are placed in water rich in oxygen, the opposite takes place.

The alimentary canal is also adaptable. It is longer in herbivora than in carnivora. If tadpoles of similar origin are fed, some on meat and others on vegetable food, the vegetarians show an intestine 8.67 times the length of the body, while in the meat-fed it is only 6 times the length of the body.

Geese, under normal conditions, have a stomach weighing 1/15 to 1/22 of the weight of the body; if they are fed on very light food, such as mash and meal, this proportion falls to 1/80 or 1/100.

Functional adaptation is thus very widespread, but hereditary structure fixes limits to it. The same form of external stimulus may have a useful or harmful action; thus thickenings of the skin of the hands act as protections, but corns on the feet are disagreeable and painful.

The subject of transmission of these characters by heredity may now be considered.

The training required for race-horses is well-known, as is the fact that good racers transmit their qualities to their offspring: thus the descendants of King Harold numbered 497 winners, and those of Eclipse 334. This suggests hereditary transmission of the results of exercise and training, but it is difficult to find satisfactory explanations for such transmission; it need not, however, be considered impossible.

If the characters of race-horses were transmissible, there should be an increase of their intensity in each generation; but von Ottingen has shown that there is a tendency for them to decrease.

The skull in young domesticated pigs is precisely like that in wild pigs, but as soon as the environment begins to be felt, differences occur. The bones of infants are smooth; but the play of the muscles soon brings out irregularities.

The heart of a recently hatched fish is larger, proportionally to the body-weight, than that of the adult: this is owing to the fact that the blood has to circulate through the vessels of the allantois before hatching; but as the fish develops, the heart does not keep pace with the body-growth, as its work becomes proportionally less.

In birds, the breast-bone is already present before hatching, but it does not ossify till the pectoral muscles exert their action on it.

General experience leads to the conclusion that it is rather the power of adaptation that is transmitted, and serves to model the individual. Transmission of acquired characters would lead to a sort of predestination of the characters of the offspring; whilst transmission of plasticity allows the offspring to adapt themselves to new environments. This is, of course, a great advantage.

Every young individual may be considered as an incomplete being whose fundamental nature is already decided, but which may be much modified by environment owing to its hereditary plasticity.

FEEDING.

148 Prof. ZUNTZ **Nutrition Experiments.** (Uber Scheinfütterung). — *Mitteilungen der Deutschen Landwirtschaftsgesellschaft,* 26 Jahrgang, Stück 47, pp. 636-638. Berlin. 18, November 1911.

Germany

The Russian physiologist Pawlow in his feeding experiment, by inserting a tube in the pharynx of the animals under experiments, made their digestive organs act without conveying nutrition to the body. In this way he succeeded in throwing valuable light on the process of digestion.

Zuntz has now struck out in the opposite direction, with a view to ascertaining the processes in digestion. By the direct infusion of foods in solution into the circulatory system of the animals, he conveyed nutrition to the body without allowing the digestive apparatus to act. In this way he was enabled to a certain extent to explain the fact that the consumption of body-material after taking food rises considerably. The possibility of the material being consumed by digestion was out of the question and it was found that some substances can be introduced in considerable quantity into the circulatory system without intensifying the processes of oxidation, but that certain albuminous substances increase metabolism independently of the digestive organs, as soon as they circulate in large quantities in the blood. This increase of metabolism is brought about by intensified work of the heart and the kidneys; it must however have other causes as well, which are not yet definitely determined.

149 H. P. Armsby and J. A. Fries **The Influence of Type and of Age upon the Utilization of Feed by Cattle.** (Investigations in Cooperation with the Institute of Animal Nutrition of the Pennsylvania State College). — *U. S. Dept. of. Agr., Bureau of Animal Industry, Bulletin* 128, pp. 1-245. Washington, October 7, 1911.

United States

It is a fact of common knowledge that marked differences exist between individual animals as regards the returns which they yield for the feed consumed, and it has been assumed that the advantages of a better type of animal lay in its ability to produce more flesh or fat from a unit of feed than could the poorer one. The existence of such differences in the metabolic processes of individuals of the same species does not seem especially probable. Moreover an observed superiority in the amount of gain in live weight made, may be conceived to arise from other causes, as, for example, from a difference in the maintenance requirement or in chemical composition of the increase, or from the ability of the one animal to consume a larger amount of feed than the other. The object of the investigation here reported was to test whether an improved animal or breed may have actually become a more efficient mechanism for converting digested food into tissue. Two steer calves were selected as the subjects of investigation. One of these was a purebred Aberdeen-Augus of typical beef form. The other a scrub steer; his sire was pobably a scrub, his dam a high grade Jersey.

These animals were about 8 ½ and 11 months old, respectively, at the beginning of the investigation and were under continuous observation for over 2 ½ years. The report of the work is divided into three parts. Part I consists of a general account of the investigations and a discussion of the principal results, but omitting the details of the respiration calorimeter experiments and of the digestion and metabolism trials. Part II records the details of the respiration calorimeter experiments and of the digestion and metabolism trials. Part III contains the necessary information regarding the technique of the investigation. The respiration calorimeter experiments failed to show that either the type or age of the steers exerted any material influence upon the percentage digestibility of the feeding stuffs or upon the proportion of their energy which was metabolized. As regards the percentage of the metabolizable energy which was available either for maintenance or for production, slight differences were observed in favor of the purebred steer and, in case of the grain, of the older as compared with the younger animal, but it is questionable whether they were large enough to be of practical significance.

On the limited grain ration of the periods outside the respiration calorimeter experiments, the scrub steer consumed relatively more hay than did the purebred animal, made an equal gain in live weight per head, and a materially greater one per unit of weight, and consumed somewhat less total air-dry feed per unit of gain.

This apparent discrepancy between the results of the respiration calorimeter experiments and those of the remainder of the investigation appears to have been due chiefly to a difference in the composition of the increase in live weight in the two animals.

The nitrogen balances show a notably greater tendency toward a storage of protein by the " scrub " than by the purebred steer, while the respiration calorimeter experiments, on the other hand, show a materially greater gain of fat by the latter than by the former. In other words the gain in weight by the scrub as compared with that by the purebred steer consisted more largely of protein with its accompanying water and to a smaller extent of fat, and therefore represented a materially smaller storage of feed energy. A similar conclusion was indicated by the results of the *block test.* From the data obtained for the available energy of the rations it is estimated that a kilogram of gain in live weight by the purebred steer was equivalent on the average to the storage of 40 % more energy in the case of the scrub. The energy requirement of the scrub steer for maintenance computed to the same live weight averaged 18.7 per cent higher than that of the purebred steer.

Accordingly the latter was able to use a relatively larger proportion of the total energy of his ration for the production of gain. A distinct influence of age upon the maintenance requirement was observed between the ages of 14 and 39 months, the requirement decreasing relatively as the animals matured. In those of the respiration calorimeter experiments in which a heavy grain ration was fed, it was found that the purebred steer had a notably greater feeding capacity than the scrub steer, that is, he could be fed larger rations of grain which he utilized to the same degree as did the scrub.

While, then, the results of these experiments failed to show any material differences between the physiological processes of food utilization in the two animals, they also show clearly an economic superiority of the purebred over the scrub steer, due first to his relatively smaller maintenance requirements, and, second, to his ability to consume a larger surplus of feed above that requirement. Both these factors tend to make the actual production of human food in the form of meat and fat per unit of total feed consumed by the animal, notably greater for the purebred animal. In these experiments this difference was masked by the inferior quality of the increase made by the scrub steer, so that on the basis of live weight alone the latter appears superior to the purebred animal.

Contrary to the conclusions drawn by the writers from earlier experiments, it was found that the availability of the energy of the grains used was substantially the same above and below the point of maintenance, and that in both cases the energy values as determined by the respiration calorimeter agreed well with those computed from the chemical composition by the use of Kellner's factors. In the case of the hay on the contrary, the availability below the point of maintenance was considerably greater than the result computed by means of Kellner's factors for the percentage utilization above maintenance. In the case of the purebred animal especially, and to a less degree in that of the scrub, rations containing less available energy and notably less digestible protein than the amounts called for by the current feeding standards for growing cattle produced entirely satisfactory gains in live weight. The tendency of recent investigations however is to show that in all branches of feeding the minimum protein requirement has been considerably exaggerated. This has been shown to be true of the maintenance requirement and of the requirement for milk production. These results suggest that it is also true for growth, but, at any rate, this branch of the subject seems worthy of further investigation.

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MARCAS AND HUYGE. **The Influence of Feeding on Milk Composition in Cows.** (Influence de l'alimentation des vaches laitières sur la composition du lait). — *Annales des Falsifications*, 4^e année, No. 37, pp. 587-588 Paris, Novembre 1911.

Belgium

A number of farmers hold the view that the feeding of milch cows exerts a direct influence on the composition of the milk. With the object of testing the value of this preconceived idea, experiments were carried out at the Dairy Station of Gembloux with two herds of cows, one comprising 15 and the other 20 head.

The first experiment, carried out on the lot of 15 cows, lasted from the 14th October to the 15th December 1910. During this time the variations in diet were as follows:

14th October to 7th November	Grazing throughout the day Put up during the night in the shed, where 2 ¼ lb. of bran per head was given and as much beet leaf as would be eaten.	
From 7th to 24th November	Kept in shed Beet leaves *ad libitum* and 2 ¼ lb. of bran per head	
From 24th to 27th November	In shed. Turnips with leaves as much as animals would eat	
27th November 15th December	Ensilage	88 lb. per head
	Wheat bran	2 ¼ » » »
	Ground maize	2 ¼ » » »
	Earthnut cake	4 ½ » » »
	Mangolds	22 » » »
	Wheat chaff	4 ½ » » »

COMPOSITION OF MILK

DATES	Dry Matter % cc	Ash % cc	Casein % cc	Albumen % cc	Lactose % cc	Fat % cc
October 14 . .	12 88	0 77	2.83	0.77	4.67	3.81
» 20 . .	12 67	0.78	3 78	0 79	4 69	3.59
» 28 . .	12.78	0.79	2 68	0.78	4.65	3.73
November 5 . .	11 97	0.80	2.54	0 69	4.59	3.24
» 8 . .	12.25	0.76	2.57	0 78	4 55	3.56
» 17 . .	11 76	0.79	2 63	0.75	4 54	3 12
» 22 . .	12.93	0.76	2.99	0 76	4.65	3.65
» 25 . .	12.70	0 79	2 98	0 74	4 55	3.65
» 28 . .	12 48	0.79	2.70	0.70	4 54	3.72
December 5 . .	12.83	0.81	2.94	0 70	4 47	3 95
» 15 . .	12 90	0.73	2.84	0.75	4 80	3 98

2nd Experiment. Duration from 22nd October to 30th November 1910

The 20 Dutch cows forming this herd were grazed during the day from 22nd October to 2nd November. At night they were given in the shed 2 ¼ lb. of bran and 2 ¼ lb. of cocoanut cake, and unlimited quantities of a mixture of straw and hay. From the 2nd November the feeding was done in the shed as follows:

Ensilaged beetroot pulp with leaves	55	lb.	per head
Cocoanut cake	6 ½	»	
« Farmer » food	6 ½	»	
Hay	44	»	
Oat husks	6 ½	»	
Bran	6 ½	»	
Oats	2 ¼	»	

COMPOSITION OF MILK.

DATES	Dry Substances % cc	Ash % cc	Casein % cc	Albumen % cc	Lactose % cc	Fatty substances % cc
October 24 . .	11.98	0.78	2.43	0.79	4.32	3.56
» 27 . .	12.00	0.78	2.47	0.75	4.32	3.56
» 31 . .	11.44	0.69	2.24	0.67	4.41	3.41
November 3 . .	11.93	0.75	2.26	0.70	4.39	3.61
» 7 . .	11.89	0.75	2.37	0.71	4.39	3.60
» 15 . .	11.69	0.75	2.43	0.62	4.44	3.45
» 20 . .	11.77	0.75	2.42	0.64	4.51	3.46
« 30 . .	12.23	0.76	2.60	0.61	4.54	3.64

The results obtained bear out those of many other experimenters, showing that the feeding of dairy cows only exercises an insignificant influence on the chemical composition of the milk.

151

V. HANSSON. **The Feeding Value of Potato Chips, Grey Starch, Meat Flour, dry and wet Maize and Barley Dust.** (Fodervärdet hos potatisflingor, grastärkelse, kottfodermjol, torr och fuktad mais samt kornskalmjol). — *Meddelande Nr. 43 fran Centralanstalten for forsoksvasendet pa jordbruksomradet Husdjursafdelningen Nr. 6)*. — *Kungl Landtbruks-Akademiens Handlingar och Tidskrift*, 50 A.; Nr. 6, pp. 469-514 tbl. 12 Stockholm, 1911.

Sweden

A series of analytical investigations and feeding experiments conducted in 1909-10 by the Central Swedish Institute for Agricultural experiments. During two series of experiments carried out in different centres, a more limited experiment in one case with draught horses, and a more extensive one with fattening pigs, the feeding-value was studied of some new and important materials recently introduced, in comparison with those already used.

Dried potato chips are an article very much in favour in Germany (1) at present, both as raw material for distilling and as fattening feed, the fodder value of which has already been established by Kellner (1). The author has just tested a Swedish product, the average composition of which is as follows: water 12.19 %; crude protein 5.02 %; crude fats 0.29 %; carbohydrates 79.91 %; ash 2.59 %; the pure protein was 2.43 % and the starch 79.92 %. In the feeding experiments carried out this product was found to be a good feed, both for draught horses and for pigs. For draught horses it can completely take the place of an equal weight of barley and can be used in feed rations up to 1/3rd of concentrated fodder, provided the albuminoid ratio remains satisfactory. If it be taken as the basis that 100 units of barley can be replaced by 93.5 units of maize in pig fattening, 90.6 units of potato chips will have the same value as 100 units of barley or 96.5 units could replace 100 units of maize. That is to say, that if barley is taken as the fodder unit, potato chips would in the fattening of pigs have a feed value superior by 9 to 10 % to that of barley, and by 6 to 7 % to that of maize, the conditions of ration considered above in regard to horses, being adhered to. Furthermore they had a favourable influence on the yield of butchers' meat and on the firmness of the meat. They can replace all the fattening feeds to advantage; from the point of view of fattening however, the most favourable results were obtained when the potato chips were mixed with barley in equal quantities in the rations.

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(1) E. PAROW, *Handbuch der Kartoffeltrocknerei*. Berlin, 1907.

Grey starch, which is a waste product in the manufacture of fecula, is used as a raw material in distilling and dextrine manufacture, or as fodder. The product tried was of the following average composition: water 13.68 %, crude protein 1.77 %, crude fats 0.37 %, carbohydrates 83.24 %, ash 0.94 % with 1.44 % of pure protein. In the experiments in question this article was found a good fattening material for pigs, but it must be used in rations mixed with other concentrated feeds. When it is dried so that it contains no more than 10 % of water, it is said to have nearly the same feeding value as barley, provided the albuminoid ratio is adjusted by adding a suitable bulky food.

As to *meat powder*, it was tested in the form of a Swedish product containing an average of 45-50 % of crude protein and 13-14 % of crude fatty substances; the result was to show that it has a feed value for fattening pigs in the sty, and that this value is sometimes below, sometimes above, that of barley. Meat flour can be used in rations poor in albuminoids, increasing their value owing to the remarkably high percentage of that substance. It has indeed been observed that it can be administered at the rate of 0.5 kg. (1 lb.) per animal per day without any injurious consequence.

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(1) *Berichte über Landwirtschaft, herausgegeben im Reichsamte des Innern*, Nr. 11, Berlin 1909.

At Svalof three experiments were made with very fine *ground maize* steeped in water at 90-95° C. (194 to 203° F.), where it is allowed to soak for 24 to 48 hours. It was noted that for pigs, maize thus treated possesses practically the same feeding value as normal dry maize.

A new fodder put on the market is a sort of *barley grit* consisting of the residues from pearling barley. The average composition of the one tested was as follows: water 12.34 %, crude protein 10.28 %, crude fat 4.72 %, carbohydrates 67.03 %, ash 5.63 %, with 9.35 % of pure protein, and a starch value of 60 % This starch value was confirmed by fattening experiments on pigs, which proved that 1.2 units of this product can take the place of 1 unit of barley.

Some pratical interest also attaches to the results of the preliminary and comparative experiments, which prove above all that 4 units of cooked potatoes (with 25 % of dry matter) possess a feed value above that of 1 unit of barley, and also that 1 unit of the dry matter of cooked kohlrabi can replace 12 units of whey.

Finally the author ascertained that the consumption of fodder per unit of increase in live weight remains constant up to the average weight, and that above this weight it increases proportionately. It is found on the average that 4.2 units of barley value are required for each unit of increase in live weight.

L. MALPEAUX and G. LEFORT **Ensilage of Fodder, Roots and Beet-pulp; Use of Lactic Ferments** (1). — *Journal d'Agriculture Pratique*, 75e année, T. II, N. 42 and 44, pp. 488-490 and 549-550. Paris 19 Octobre and 2 Novembre 1911 **152**

France

The authors had long noticed that the silos where the keeping proved best, were those in which acid fermentations took place, probably because the acids formed played the part of preservatives, hindering the development of certain injurious bacteria.

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(1) Another source is: L. MALPEAUX & G. LEFORT. *Ensilage des fourrages, des racines et des pulpes; emploi des ferments lactiques. — La Sucrerie indigène et coloniale*, 47e année, No. 19 and 21, pp 443-446 and 490-493. Paris, 7 and 21 novembre 1911

It was therefore desirable to ascertain which were the good ferments, and to study the conditions of their development, in order to take them into account in practice.

Lactic ferments are the best, and MM. Bouilliant and Crolbois succeeded in isolating among a number of lactic ferments of different origins, a ferment accustomed to live in acid media, which they termed the "Lacto Pulp" because it develops very rapidly in beet pulp.

The trials carried out for the last two years with this product, both in the laboratories and on farms and sugar works, on sugar and distillery pulp, have proved exceedingly favourable.

The authors in 1910 tested the "Lacto Pulp" on several descriptions of silage, which they classify as follows:

1. Sugar-works pulp, obtained by cutting and diffusion.
2. Distillery pulp, obtained by rasping and pressing.
3. Mangolds cut up small.
4. The collars and leaves of beets.
5. Chopped green maize.

The losses of gross weight undergone by the mass in the silo, were ascertained on samples of 50 kg. placed in all the silos and kept in large-mesh bags. From these same samples portions were taken for analysis.

1) *Pulp ensilage.* Pulp from sugar-works and distilleries, left in silos without any further measures, gives out a bad odour, becomes soft and greasy in appearance and tends to turn into a pasty mass from which a black and nauseous liquid escapes. When eaten by animals, these pulps, owing to the toxic substances developed by certain bacteria, cause scouring, enteritis, and special symptoms characterising a peculiar disease called "pulp disease".

One of the essential advantages, however, of the use of cultures of lactic ferment results from their action as preservative and anti-putrefaction agents, which prevent the pulps from becoming dangerous to cattle.

a) Ensilage of sugar-works pulps (diffusion pulps). The authors give the following table relating to ensilage pulps, without special treatment:

Winter (November to March)	Loss of Gross weight	 Dry substance
1903-1904	19.5 %	22.6 %
1904-1905	17	17.9
1905-1906	23	25.6
1906-1907	21	29.5
1909-1910	18	21 9

There are fairly marked differences between these figures, particularly in relation to the dry substance. They are due to the losses being modified by a large number of factors, such as the moistness of the pulp, the degree to which it has been cooked, the atmospheric conditions, and above all the variety of fermentations coming into action. It will be readily understood that the pulps treated with "lacto pulp" must keep much better.

With the 1909-1910 pulps treated with lacto-pulp there was only 16 % loss of gross weight, and only 15.6 % loss of dry substance. This year the losses of gross weight in pulps treated with lacto-pulp are higher than for those not treated (25 % instead of 20 %) but the losses of dry substance show the advantage of the lacto-pulp. Salting the pulp jointly with the use of lacto-pulp tended to increase its keeping properties. Losses of dry substance for an ensilage of 126 days were as follows :

27 % in pulps not treated ;
16.5 % in pulps treated ;
11.3 % only in pulps salted and treated with lacto-pulp.

These experiments were carried out with pulps from a factory where they are drained off at a relatively low temperature. With the pulps from another sugar works where the beet pieces were more thoroughly cooked, the losses were, for 5 months' keeping, 24 % of gross weight and 19.25 % of dry substance with treated pulps ; 26 % of gross weight, and 24.6 % of dry substance with untreated pulps.

b) Ensilage of distillery pulps (rasp and continuous press pulps). The distillery pulps were less watery when fresh than the diffusion pulps, and inconsiderable losses of gross weight resulted. With regard to the dry substance, in 112 days there was a loss of 7.4 % with treated pulps, against 14.8 % when the treatment was not carried out. These pulps kept better than diffusion pulps. Undoubtedly, this must be attributed to the different method of industrial treatment. In the distillery, the beetroot is cooked less, and its tissues are less broken up than in diffusion. In addition, it retains more sugar, which promotes the growth of lactic ferments.

c) Influence of lacto-pulp on the composition of pulp silage. The pulps treated remain more rigid, keep their original form and are more easily drained than the others ; their content of dry substance remains higher, and this is an indication that they are less attacked by bad ferments ; their appearance and clean smell, resembling those of pulps straight from the factory, prove that they have only been altered in the very slightest degree. Treated pulps are more nutritious than those without lacto-pulp. The losses of food nitrogen are very limited, the cellulose is less deteriorated and there is also observed a smaller loss of carbo-hydrates.

The use of lacto-pulp is the more advisable in proportion as the keeping is to be of longer duration. The experimenters kept treated pulp and untreated pulp for 20 months in two jars sealed with paraffin. The untreated continued to decompose, its volume was reduced by two-thirds, and at present it forms only a pasty mass partly immersed in the juice exuded. On the other hand the treated pulp still fills its jar and seems to have undergone no alteration. The lumps are still similar in structure to those emerging from the diffusion battery.

2. *Ensilage of sliced mangolds.* When external conditions are normal, the mangolds left entire keep very well in the silo, but farmers are in the habit of chopping them up beforehand to reduce the cost of handling them before use. This method involves losses far in excess of those undergone by entire roots. The experimenters investigated whether the use of lacto-pulp does not reduce these losses. They found that after 5 months ensilage the losses of dry substance, which were 29.6 % for the untreated lumps, did not exceed 10.8 % in the treated lumps; furthermore, the secondary fermentation had been active in the fomer, while alcoholic fermentation alone had occured in the latter. This second fermentation converts the sugar into alcohol and acetic acid, which play the parts of stimulant and condiment in food, a function not to be under-valued.

3. *Ensilage of the collars and leaves of beets.* The collars and leaves of beets can only be kept by ensilage; but there are always extensive losses. The experimenters tested the influence of lacto-pulp on the losses of gross weight and dry substance. Their trials comprised two descriptions of silos: earth silos made by excavation, and silos erected on ground level and covered with earth. They found that after six months' keeping the losses were practically the same for the ensilage without treatment and with, but that they were higher in the thrown up than in the excavated silos. These losses are indicated in the following table:

	Excavated silos		Stack silos	
	Untreated	Treated	Untreated	Treated
Percentage of loss of gross weight	54	50	58	59
Percentage of loss of dry substances	53	56	68	61

The results of treatment are less clear than with pulps and sliced mangolds; still it was noted that in the two classes of silos this influence is chiefly characterised by better quality of the products. They approximate in appearance to the fresh substance much more closely than without the use of lacto-pulp.

The losses of food protein are also less substantial, and this again is an indication of their greater resistance to putrefactive agents.

4) *Ensilage of chopped green maize.* The ensilage lasted six months. The authors tried three kinds of silos · excavated in the ground, built up from the ground, and formed of tight planking.

The following results were obtained ;

	Excavated Silos		Ground-level Silos		Plank Silos	
	Untreated maize	Treated maized	Untreated maize	Treated maize	Untreated maize	Treated maize
Percentage loss of gross weight . .	45	45	—	59	13	39
Percentage loss of dry substance .	42	40	—	49	7	29

In excavated silos the losses are almost equal for the treated and untreated maize, but in the former case the products are finer in appearance, their quality is better and their grade of protein is higher.

In silos on a level with the ground the losses were greatest. It is therefore preferable to dig a pit.

In the watertight silos the losses were least. This is the ideal process for keeping maize. Excellent results have been obtained in America, where this method of ensilage is in ordinary use. It must be noted that in experiments with watertight silos the greatest losses occurred with treated substance. The writers attribute this anomaly to a defect in the silo, which had cracks in it so that the liquid was drained off. This is a detail of very great importance ; last year the authors cut some holes in the bottom walls of a plank silo, to turn it into a drained silo ; they obtained 34 % loss of dry substance against 20 % in a similar silo perfectly watertight. For the rest, it is easy to understand that in a drained silo, just as in an earth silo, there is a larger loss of bulk resulting from the continous drainage of the mass, in which fermentation is rendered more active by the permeability of the medium. In watertight silos on the contrary the liquids are kept in the ensilaged mass and they fill up the vacant spaces where the air would have remained.

From the whole of their experiments the Authors conclude that the treatment of substances intended for ensilage with lactic ferments, in the majority of cases, reduces the losses in nutritive elements and enables the food to be kept sound, sweet-smelling, free from putrid ferments and faultless, both from the food and hygienic point of view.

158 D. FERUGLIO. **Present Condition of our Knowledge of Ensilage.** (Stato attuale delle conoscenze sull'infossamento dei foraggi. Relazione al II Congresso Nazionale di Chimica Applicata. Torino, Settembre 1911). — *Bull. dell'Associaz. Agr. Friulana*, Anno 56, Serie VII, Vol. 28. Udine, 31 Ottobre 1911.

Italy

After setting out clearly and concisely the ideas gained by scientific and practical methods in relation to the complex phenomena of ensilage, and after referring to the direction of new studies, the writer sums up as follows the general conclusions he arrives at:

In the present condition of our knowledge, ensilage still presents several unsolved problems. It cannot be determined whether it is always desirable, nor yet can it be ascertained what is the best means of preserving green fodder. The prevention of the activity of the tissue cells and of bacteria, by means of special substances already studied in the past, deserves to be examined attentively, because it is calculated to reduce to a minumum the losses and conversions taking place during ensilage.

The principal changes which occur during ensilage are due to the cellular and enzymic actions; the subsequent course of the process and the normal success of silos are in a great degree subject to the influence of phenomena of bacterial activity, and though a study of this activity may have been undertaken under good conditions, it does not yet allow of generalisation in the form of safe rules for determining an absolutely preferable course of treatment favorable to specified bacterial actions, regarded as the best.

The substances which give rise to processes of decomposition are limited, under normal conditions of ensilage, and as regards maize, to the following groups: hemicellulose, sugars and protein substances. The fatty substances (ether extract) and cellulose are not attacked to any noticeable extent.

The compounds isolated from maize silage allow of forming a precise idea of the value of this decomposition.

The splitting up of the protein substances due to enzymic action is generally not very profound, and the products formed present a value superior, for the normal organism, to that formerly attributed to them.

The bacteria exert their action principally on the carbohydrates and their derivatives ; furthermore they may also attack the first products of transformation of protein substances, giving rise to final compounds of a lower nutritive value.

The loss of dry substance varies greatly according to the conditions of ensilage ; as an average 10 to 15 % may be assumed ; this average may however rise to above one quarter or even one third of the total.

The vegetation of moulds is normally prevented in silos by insufficiency of oxygen. If this vegetation is made possible, the transformations taking place are essentially different ; putrefaction and alkalinisation of the mass take place with substantial loss of dry substance, conversion of non-protein into protein substances, and loss of nitrogen.

Recent studies have contributed appreciably to the solution of this problem ; it is desirable however that these important enquiries should be continued on different fodders ; it is requisite to proceed methodically, carefully checking the data hitherto ascertained, allowing also for physical conditions in connection with the ensilage, and finally taking care that the studies, both chemical and bacteriological, are co-ordinated and mutually supplement each other

154 O. FALLADA. **The Use of Dry Yeast in the Composition of Molasses Feed.** (Uber die Verwendung von Trockenhefe zur Herstellung von Melassefutter. — *Mitteilungen der chemisch-technischen Versuchsstation des Zentralvereines für die Rübenzuckerindustrie, Serie IV, N. 28)* — *Osterreichisch-Ungarische Zeitschrift für Zuckerindustrie und Landwirtschaft,* XL J., 5 H., pp. 709-714 Wien, 1911.

The researches of Delbruck, Kellner and Völtz have proved in a satisfactory manner that dried yeast makes an excellent feed.

Austria

Therefore, the writer thought that it would be advantageous to mix yeast, which is very rich in protein, with molasses, which is almost without this substance. It was found that the yeast absorbed the molasses, and experiments proved that the best proportion, from the point of view of consistency and preservation, is 1 kg. of molasses to 800 g. of dried yeast.

With a dried yeast containing 43.38 % of protein, and molasses with 51 % of sucrose, a mixture is obtained having a protein content of 19.94-20.81 % and a sucrose content of 28.30-28.80 % while according to Stutzer's method, the digestible protein is 90.1-91 % of the total amount of protein, almost the same as that in the original dried yeast. (90.1 %). Before being mixed, the yeast had a slight acid reaction and the molasses an alkaline one, while the reaction of the product was neutral.

This is explained by the fact that the yeast is intimately mixed with the molasses.

The mixture was kept for ten weeks, and, whether exposed to the air or not, remained almost unchanged; a small increase in the amount of water present was however observed in the first case. This comes from the reabsorption of the water which evaporated during the heating necessary to facilitate the mixing.

Nevertheless, it should be noticed that the product obtained in this manner contains no cellulose, and therefore cannot be used alone, but only added to the food rations.

In conclusion, it is possible to prepare readily laige quantities of a product which keeps well and is easily transported.

This is of great importance to agricultral economy, especially in the case of countries which produce much beer and beet-sugar. This new concentrated feed should, however, be further experimented upon by farmers and its value tested in making up food rations.

BREEDING.

155 HUGUET et LHOSTE. **A New Method of Proving Delbœuf's Law.** (Nouvelle démonstration de la loi de Delbœuf). — *Revue vétérinaire*, 36e Année, No. 10, pp. 605-614. Toulouse, 1er octobre 1911.

France

MM. Huguet and Lhoste have recently elaborated a simplified proof of Delboeuf's law. The law is stated here.

Delbœuf's Law. " However large may be the number of individuals similar to itself, and however small the number of individuals different from itself, to which an isolated organism may give rise, the time will arrive when the descendants that have varied will outnumber those that have not varied, provided the different generations breed in the same manner."

Delbœuf's Hypotheses.

1. " Let us suppose that an individual produces N individuals similar to itself, one showing a plus variation, and one showing a minus variation, total $N + 2$: this number may be called the power of reproduction ".

2. " Further, let the individual die directly it has given rise to its offspring; consequently, at any given moment all the existing individuals will be the same number of generations away from the original ancestor ".

3. " It is also assumed that multiplication goes on indefinitely, without any obstacles to the increase in numbers ".

4. " All the individuals produced are counted equal in the chance of life ".

5. " The various generations will breed in a similar manner to the original ".

Proof of Delbœuf's Law.

Let us suppose that an individual A produces N_s individuals similar to it, and 2_d not similar to it; the first generation will thus be $N_s + 2_d$ (1).

As each descendant will have the same progeny conformably with *Hyp.* 5, the second generation will be represented by the square of the above expression, *i.e.* $N_s^2 + 4n_{sd} + 4_d$. The generation m will be represented by $(N_s + 2_d)^m$, that is, $N_s^m + m N_s^{m-1} \cdot 2d$

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(1) The letter s indicates individuals similar to A; d indicates those dissimilar to A; sd indicates those similar to the ones not similar to A, that is, the same as d; but for clearness it is here retained as sd (*Ed.*).

$$+\frac{m(m-1)}{1.2} N_s^{m-2} \cdot 2_d^2 + \frac{m(m-1)(m-2)}{1.2.3} N_s^{m-3} \cdot 2_d^3 \ldots \text{ etc.}$$

The genealogical tree reproduced below allows the verification of this representation of Delbœuf's law.

WORK OF LIVE - STOCK ASSOCIATIONS AND OTHERS FOR ENCOURAGEMENT OF BREEDING.

Aiding Exports in Great Britain. — *Live Stock Journal*, No. 1963, p. 498. London, Nov. 17, 1911. 156

Great Britain

Few subjects are of greater importance in British breeding than the exportation of pedigree live stock, and the report of the Departmental Committee of the Board of Agriculture dealing with the matter will, doubtless, be perused with lively interest. The object of the Committee was to enquire and report as to the character of the British export trade with the Colonies and other countries, and to consider whether any steps can with advantage be taken with a view to its development. The trade is even more important then its financial returns indicate. All the Cattle Disease legislation has had the object of furnishing a clean bill of health, so that colonists and foreigners can resort with confidence to Great Britain for fresh blood. The report of the Committee recommends that there should be no relaxation of the existing live stock import regulations, and a further recommendation is that official assistance should be given for research works as regards the prevention and cure of contagious diseases of animals. A very considerable portion of the evidence referred to a proposal which, it was represented, would be of the very greatest advantage to the export trade, viz. the establishment of a Government Station in this country for the purpose of testing live stock before exportation.

It has also been recently proposed by the National Cattle Breeders' Association that a quarantine station should be established in England, from which cattle may be exported after a proper period of detention in the case of outbreaks of scheduled diseases, subject to such regulations as may be approved by the Governments of the countries to which stock was being exported.

It is very undesirable that inferior stock should be exported. The keeping of milking records is an excellent plan, and it is to be hoped that the official encouragement and assistance recommended may be granted.

The welfare of the export trade depends primarily on the breeders themselves, and no assistance should be given from public funds in any form which might relieve them of their duties and responsibilities in the matter.

British live stock would not have reached the position it has attained abroad, if breeders had not relied on self-help in the past, and they see no real indication now of a widespread desire to substitute official for voluntary effort, though organised work by the Breed Societies might be extended with advantage.

157 EUTH. **The Modern Problem of Cattle Breeding in Uruguay.** (El problema moderno de la Ganaderia uruguaya).—*Revista de la Asociación Rural del Uruguay*, No. 9, pp. 668-679. Montevideo, Sept. de 1911.

Uruguay

On comparing the exportation of cattle products from Argentina with corresponding Uruguay products, it is seen, allowing for the great difference of the areas of the two countries, that Uruguay is far from producing the amount it should in agriculture and livestock. Consequent upon this is the necessity of resorting to all possible measures for a more complete utilisation of the wealth which Uruguay owes to its soil and climate.

The whole of the northern part of the Republic is of such a character that the grazing industry is remunerative and will continue to be so for a long time. The dry pasturages are particularly suitable for fine-wooled sheep, yielding good meat, such as the Rambouillet. The fine wool of Uruguay has already gained a worldwide reputation, owing to its homogeneity, fine quality and strength. Many farmers believe it possible still further to improve this wool by cross-breeding, but this is a mistake because the cross-breeding should be accompanied by an improvement of feeding, which is an impossible thing in the grazing industry.

There are three breeding zones in Uruguay. The first, the sheep-grazing zone, undertakes the present breeding of sheep and hardy cows. The second, which is better for pasturage, but is ill-adapted to crop growing, admits of raising English half-breeds for meat, including Herefords and Devons. The third zone, which is well adapted for agriculture, and can feed the improved breeds, Shorthorn and Durham, for meat and milk.

As regards extensive cattle breeding, cattle for the meat market must be chiefly taken into consideration, and only the present sheep and native oxen can thrive under the present breeding system. In the second zone, cattle are divided into two categories: those less than and those more than 2 ½ years old. To attain a maximum yield in this zone, it will not be sufficient to cross and improve the strains; provision must also be made for storing fodder for winter and to make good the shortage of pasture land.

The third zone being agricultural, will reach its maximum development when cattle breeding has also been developed to its utmost; the breed best fitted for this zone is the Shorthorn, which can be supplied with good grass land and an ample accessory food supply. As regards sheep, preference must here be given to Lincolns, the wool and meat of which are very good.

Great development is also open in Uruguay for milk-yielding breeds, and among the latter the individuals which best utilise their food will be selected.

Uruguay must also raise meat strains which can gain a footing in foreign markets and face the keen competition. The Shorthorns are highly suited, but it must not be forgotten that they always require plentiful and rich food.

Uruguay already possesses very well organised extensive breeding which should form the basis for all subsequent improvements. These improvements depend on the adaptation of scientific European methods to local practice.

Above all it will be essential to determine by experiment the economic laws which govern the production of meat and milk and working conditions existing in Uruguay, and to ascertain the influence exercised by the results obtained. After this, exact instructions may be given to breeders.

An experimental institute in connection with cattle breeding might render great service by taking the lead in the re-organisation movement; it is consequently absolutely necessary to establish at an early date a breeding experimental station which will point out to breeders a safe course for agriculture and livestock development, while it will give a practical education to students. This institute will be attached to the Zootechnic Department of the Superior School of Agriculture

HORSES.

J. Cossar Ewart. **Origin of the Clydesdale and other Heavy Breeds of Horses** — *Trans. of the Highland and Agric. Soc. of Scotland*, Vol. XXIII, p 169. Edinburgh, 1911. 158

Great Britain: Scotland

From anatomical studies of fossil and living races of horses, it seems evident that our modern heavy breeds are not descended from a single prehistoric race but are a blend, in most cases, of three perfectly distinct wild races.

If Clydesdales, like thoroughbreds, notwithstanding domestication and artificial selection, are really a mixture of several distinct types which refuse to blend to form a pure breed, it is evident that breeders of Clydesdales, like breeders of thoroughbreds, should avoid having too many " free generations " between the sire and dam ; in other words, they should, unless for special reasons, avoid crossing distinct types.

Having by accident or design secured a good strain, they should endeavour to maintain the strain in all its purity. On the other hand, breeders who have indifferent strains should bear in mind that it is possible, by working on Mendelian lines, to engraft on their strain the points (*e. g.* good shoulders) which appreciably increase the value of other strains. By mating unrelated mares with a stallion having the points desired, and then interbreeding the offspring or mating their fillies with a half-brother (out of an unrelated mare of the right type) from another stud, they will have a good chance of obtaining what they desire.

It may be added that breeders of heavy horses might well bear in mind that animals with hoofs and limbs of the " steppe " or " Siwalik " type are more likely to stand the wear and tear of city life than animals with broad hoofs, round cannon bones, and hairy heels, inherited from a " forest " race, adapted for the moist pasture-lands and peat-bogs which prevailed in Central Europe in prehistoric times.

159 H. J. GOBERT **Horse Breeding in France** (L'élevage du cheval en France). — *La vie agricole et rurale*, No 1, p. 6-7. Paris, 2 Décembre 1911.

France

The excessive growth of the motor industry a few years ago seemed likely to crush horse-breeding out of existence. In reality it has only supplanted to some extent the light-weight shaft horse and carriage horse, but the stock of horses as a whole has undergone constant increase.

Recent statistics demonstrate that the number of horses kept in France was 3 236 130 in 1909 ; it was less than 3 million 15 years ago.

In large cities which are the centres of motoring, a rather rapid drop in the number of horses is nevertheless recorded. In Paris, for instance, the number of horses has fallen off by nearly one-half during the last 10 years. Trades and industries which depend for their livelihood on the horse are great sufferers from this position of matters.

Half-bred stud farms are compelled to yield more and more to the demands of the market, which chiefly require a weighty draught horse, and a considerable growth is witnessed in the number of mares put to draught stallons, even in regions which used to produce almost exclusively thorough-bred horses, such as Normandy. This change is pretty clearly manifested in the figures of the following table :

	Mares served in France by approved and authorized stallions		
	By draught stallions	By half-bred stallions	By all stallions
1899	—	—	246 036
1900	—	—	243 466
1904	41 111	109 289	263 626
1905	40 648	105 490	261 005
1906	40 136	98 259	252 088
1907	41 954	89 410	243 416
1908	45 312	88 350	243 345
1909	48 103	87 226	250 920

The half-bred horse has also to meet rivalry from the cow ; for farmers tend to increase their stock of heavy cattle, as being more profitable than horses

Dr. Bödecker. **The Use of Mules in Agriculture.** (Zur Maultierverwendung). — *Illustrierte Landwirtschaftliche Zeitung*, 31 Jahrgang, No. 93, p. 867. Berlin, 22. November, 1911. **160**

Germany

The use of mules for farm work has just been introduced into Germany, as oxen are more and more difficult to obtain. There is every reason to hope that the mule, owing to its length of life, natural strength and thriftiness will become a valuable working animal in German agriculture, and the question deserves full public attention. Systematic mule breeding has already been begun ; in the spring of 1911, the first foals were born in Hanover.

For the moment recourse must be had for supplying the needs of the country to importation from abroad. In the course of 1911 several hundreds of mules and mule foals were imported from France. The Berlin Omnibus Company is carrying out trials in the use of mules as draught animals; importation therefore promises to become more and more considerable.

CATTLE.

161 **A National Scheme of Milk Records.** — *The Farmer and Stockbreeder*, No. 1155, Vol XXIV, pp. 2077-2078. London, Nov. 13, 1911.

Great Britain

The action of the British Dairy Farmers' Association in appointing a committee to consider how far milk records might be encouraged is an extremely important step. There are societies which encourage it amongst pedigree stock, and in Scotland the Highland and Agricultural Society took the matter in hand, in relation to Ayrshire cattle, greatly to the benefit of breeders who participated in the movement

To secure the greatest amount of good out of a scheme of milk records it is necessary that public confidence should be won. That is the first step in organising a scheme which will be applicable to all parts of the country. The most elaborate method, and certainly the most accurate, is to weigh all the milk that the cows give. It is not a very costly proceeding, and it does not involve waste of time. From the slate, yields may be copied down on to a sheet and posted weekly into a book. The most careful recorders have found it to their advantage in ordinary business herds to institute a system of checking. That is to say, that the milk taken away and used must be accounted for, and it should tally with tolerable accuracy with the milk sheets. Then there is the weekly or bi-weekly system of taking the records. The weekly method is very nearly accurate. For practical purposes it is quite good enongh, and it would certainly be a long step in advance even if weekly weighings could be instituted. It is necessary, of course, that a responsible person should be present during these weighings, or pay surprise visits for the purpose of checking the results. It is of no good forcing cows for a particular record day, giving an extravagant idea of their capacity as milk yielders.

A controllling anthority is essential, and what we should like to see is an authority set up within every country, consisting of representatives of leading farmers duly elected. Small charges might be nade so as to cover the expense of sending inspectors down on surprise visits. Without these visits it is impossible to obtain the maximum benefit from any system of records. Public confidence can only be obtained by showing that the methods are perfectly fair, and that the claims made on behalf of the different herds are substantiated by independent authorities.

The advantages from milk records can be summarised in this way. They would be of benefit to the individual farmer himself. He would know which cows to discard and which cows to keep, which calves to select for rearing and which to dispose of.

The records would increase the value of animals bred from deep-milking lineage. This increase would more than repay the trouble in keeping accurate records.

They would raise the general average of milk yields in the country by one third. That, at all events, is the experience of other countries, and there is no reason why it should not be the same in England. To obtain the full value of records there must be inspection. This is a crucial point and one which should be insisted upon in any scheme that is drawn up for favourable consideration.

With regard to the method of working such a scheme on a national basis, one can conceive of no better means than by taking the ordinary geographical boundaries of each county and organising county committes to do the work, leaving their representatives to be elected by the individual members. It would be necessary to have a controlling body, and such a body might well be formed by the British Dairy Farmers' Association.

Cattle imported for Breeding purposes into the United States. — *U. S. Dep. of Agr., Bureau of Animal Industry*, pp. 1-8. Washington October 12, 1911 **162**

United States

This publication contains a list of the cattle imported into the United States for breeeding purposes from April 1. 1911 to June 30 1911 inclusive, for which certificates of pure breeding have been issued under the provisions of B. A. I. Order 175 of the U. S. Dept.

of Agriculture. The following table shows the total number of cattle imported for every single breed. (1)

Breed	Bulls	Cows	Total
Alderney	6	61	67
Ayrshire	2	65	67
Guernsey . . .	30	382	412
Jersey	26	331	357
Shorthorn . . .	3	3	6
	67	842	909

108 CH. S. PHELPS. **The Guernsey Breed in the United States. Its History and Leading Characteristics** (2). — *The Connecticut Farmer;* New Haven Conn. September 23, 1911.

United States

The small group of islands located in the English channel, have given to the world two of the leading breeds of dairy cattle, the Guernsey and the Jersey. The laws of each island have prohibited the bringing in of any cattle for breeding purposes for about 100 years, so that the two breeds were kept distinct from each other and from other breeds. The best evidence obtainable, however, points to the conclusion that both breeds had a common origin, the characteristics of the Normandy cattle predominated in the Guernsey breed while the characteristics of the island cattle predominated in the Jersey breed. The size and the rich orange color of the Guernsey are probably traceable to the Norman blood. The average size of the Guernsey is from 950 to 1000 pounds live weight and the bony frame is somewhat coarser and heavier than that of the Jersey In the earlier importations into the United States of 40 years ago the solid orange fawn prevailed, but in recent years there is a tendency among breeders to develop the fawn and white spotted, and often the white patching prevails. The most valuable characteristics of the breed are· their docility, their mellow, waxy, yellow skin, and their rich, yellow milk and butter. Many animals of the breed are heavy milkers, frequently averaging 8000 to 10 000 pounds per year, although herds of 20 or more that will average 6000 to 6500 pounds per year may be classed as choice. Their strongest point is the high yields of butter fat Several herds in the United States show an average of over 400 pounds of fat, equivalent to 467 pounds of butter, while several advanced registry animals have produced over 900 pounds. Among the earliest importations of Guernseys to the United States were those made into Connecticut by E. Norton of Farmington and Ch. Beach of West Hartford in 1867. Some of the best herds of the east were developed from these early Connecticut importations, and the country within 10 to 15 miles of the farms of these pioneer Guernsey breeders is now noted for many fine herds of Guernsey grades besides several choice herds of pure breds. The merits of the Guernsey breed were especially brought into public notice by the great breed test at the world's fair in 1893, and later by the breed test at the Buffalo exhibition in 1901. At the latter test the Guernseys won the distinction of producing butter fat at the lowest food cost of any of the breeds entered.

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(1) See *Bull.* March 1911, No. 900 *(Ed.)*.

(2) Cp. *The Science aud Practice of Farming during 1910 in Great Britain,* pp. 452-474, 476, 477. *(Ed)*.

Since 1893 the breed has gained in popular favor both as the rich man's cow and as a money maker for the practical dairyman who has a choice milk, cream, or butter trade.

The Guernsey Breeders' Association was the first to establish an Advanced Registry and to advocate the merits of the yearly tests, based on the actual yields of milk together with the yearly yields of butter fat to be obtained by frequent fat tests of the milk. The Advanced Registry work has been a great value in bringing the breed into public notice, and in establishing a sound basis for selection in breeding. The great demand for Advanced Registry sires of the Guernsey breed shows that practical dairymen are now looking to performance as the surest basis for improvement. The Guernsey is probably the best family cow that can be had to day. Her docility adapts her to small places with little or no pasture, while the richness and high color of the milk cannot fail to please the keenest tastes. Today many retail milkmen are finding it to their advantage to introduce into their herds quite a proportion of Guernsey blood to improve the quality and color of their milk.

G. Luthy. **The Sale of Bulls in Bern-Ostermundingen.** (Vom Zuchtstiermarkt in Bern-Ostermundingen) — *Deutsche Landwirtschaftliche Tierzucht*, 15 Jahrgang, No. 45, pp. 541-542. Berlin, 10 Nov. 1911. **164**

Switzerland

The Association of Swiss Spotted Cattle (Simmenthaler) Breeders every year holds a sale of bulls in Bern-Ostermundingen, at which prizes are awarded to specially good animals

The sale is of the character of an exhibition, and only pedigree bulls aged 8 months to 3 years can be entered. At the last sale, which took place on August 29 and 30, 1911, 781 animals were brought up, of which 481 received prizes. The award of prizes to all animals over 18 months is according to a system of points totalling 100.

In a special group, breeding collections were exhibited (bulls with their offspring). This clearly showed the great influence which good sires may have on a herd.

The material exhibited was good ; not only in the foremost ranks were good and very good animals found, but the market as a whole testified clearly to successful breeding work.

402 animals were sold at a total of 365,000 francs (£ 14,450). Foreign buyers were present, particularly from Hungary and South Germany.

165 TARTLEE. **The Transylvanian Buffalo.** (Der Siebenbürgische Büffelochse, ein wertvolles Arbeitstier der Zukunft). — *Landwirtschaftliche Umschau*, No. 46 pp 1067-1069. Magdeburg, 17. Nov. 1911.

Hungary: ransylvania

The Transylvanian Buffalo presents the best advantages for breeding, because it is astonishingly hardy, both as regards the quality and the quantity of food with which it is content.

The size of the Transylvanian Buffalo is impressive. The length of the body in a 9-year-old is 7ft-7in., its shoulder height 5ft.3in. and its rump height 4ft. 9in. It is brownish black or black with a white patch on the forehead. The fore-quarters are more shaggy than the hind quarters. Sometimes white or whitish Buffaloes are met with. In the Transylvanian Buffalo the fore-quarters chiefly develop. Although the Buffalo is heavy in appearance, the animal is rapid in its movements and pace.

Though exceedingly hardy, it needs the heat of the shed during severe frosts. It also feels the need of a complete plunge into water when very tired. It is easily angered and sometimes very dangerous. The work which one of these Buffaloes can supply is at least 40 to 50 % above that of a good ox. Its strength is shown chiefly in road transport. It makes full use of pasture, even the sparsest and poorest. It could easily be acclimatised in Germany.

In Transylvania a pair of Buffaloes at the age of 6 years costs no more than 750 francs (£ 30).

SHEEP.

Sheep Farming and Meat Situation in South Russia. *Diplomatic and Consular Reports.* No. 4781, pp. 1-104. London, September, 1911. 106

The decay of sheep farming in South Russia is due to the increase of the population, the ploughing up of land under pasture and its division into small holdings.

Russia Merino sheep farming was introduced into Russia about 100 years ago; in 1812 there are supposed to have been 150 000 merino sheep in Russia, in 1825 there were 1 000 000 and in 1880, thanks to the development of sheep farming in the Caucasus, there were about 15 000 000 Since then the numbers have decreased, especially in the Governments of Poltava, Kursk, Kharkow and Voronezh, and in 1906 there were only about 6 000 000; in the course of the last three years the numbers have continued to decrease. In 1885 the total merino wool clip in European Russia and in the Caucasus amounted to 37 000 tons, but in the year 1909 it was only 19 000 tons. In 1885 there were about 50 000 000 sheep in European Russia and in 1906 about 43 000 000.

The production of tallow in Russia, in 1910, was very small. A century ago sheep could not be profitably sold for fresh mutton, but were killed in the large slaughter houses known as *Salgany*; their skins were sent to the fur makers, their fat extracted, and the remainder salted for sale in the winter. Now, even in spite of the annually increasing price of tallow, comparatively few sheep are sent to these *salgany*. In 1909, 775 000 sheep were thus killed (in South Russia), and in 1910 only 630 000. In the near future it is probable that all the sheep available will be taken for fresh meat.

Not long ago Russia was remarkable for cheap meat of good quality. Russia exported meat cattle and sheep over the Western frontiers, and also through the southern ports to Turkey, Greece, Egypt and Malta. This trade has nearly ceased. The beasts exported are much fewer and are very inferior in size and quality. With a rapidly increasing population and the disappearance of free pastures, the value of meat must continue to rise, and the introduction of new methods of cattle farming are imperative.

The residues from oil-factories and molasses from sugar factories are most useful, and eventually a solution may lie in the creation of irrigable meadows planted with quick-growing fodder plants, which by systematic manuring may give several crops in a season.

167 **World's Production and Consumption of Wool.** — *The Board of Trade Journal.* No. 781, pp. 333-334. London Nov. 16, 1911.

Europe. America. Australia

The number of sheep in Europe is steadily decreasing; the increase in the yield of wool per sheep has up to the present kept the output of wool on the Continent almost constant, but this will soon cease to be the case, since the yield per sheep cannot increase much in the future. The North American flocks should increase in size, at any rate for some years to come. The Australian flocks, temporarily lessened by drought have begun to grow again. The number of sheep in Australia and New Zealand increased from 110 480 000 in 1909 to 115 450 000 in 1910.

The yield of wool per sheep has also increased considerably, thanks to judicious crossing, selection, and the infusion of merino blood. In the Argentine the flocks moved into colder regions bore the change of climate very well The drought of 1909 destroyed many lambs and greatly reduced the output of wool in 1910, but there is stated to be an improvement this year.

The world's production of wool in 1910 is estimated at 1340 million kilograms. Making allowance for the quantities consumed by local industries in the contries of exportation, the supplies available for the manufacturers of Europe, and North America were as follows:

Production in tons (of 1000 kg)..

Continent of Europe	190 260
United Kingdom	64 779
North America	150 849

Exports in tons (of 1000 kg.):

Australasia	387 315
Argentina and Uruguay	696 149
South Africa	56 625
Other Countries outside Europe	107 361

The quantity available in 1909 amounted to 1 174 176 000 kilogs. The supply for the manufacturing countries was thus about the same in 1910 as in the preceding year; the supply from Australasia increased by 7 per cent. And that from other exporting countries decreased.

The consumption of wool has grown very slowly in the last decade, increasing, during the years 1901-10, by only 15 per cent. In 1910 there was an increase, as compared with 1909, in the consumption in Europe, and especially in the United Kingdom, and a considerable decline in that in North America.

The consumption of raw wool during the year 1910 is estimated to be as follows:

	1000 Kilogs
Continent of Europe	644 600
United Kingdom	277 600
North America	231 000

The Wool Trade in Australia. (Report of the Italian Consul in Melbourne). (Il Commercio delle lane in Australia). — *Bollettino del Ministero di Agricoltura Industria e Commercio.* Vol. II, Serie B, Fasc. 8, pp. 265-266. Rome, 15 Ottobre 1911. **108**

Australia

The production of wool in Australia in 1909-1910 was about 175 000 bales above the previous year. Quite contrary to expectation, the increase for the present year does not promise to be anything more than insignificant. This is chiefly due to the splitting up of the large estates which used to exist. A new agricultural policy has just been inaugurated; the attracting of immigrants is aimed at; the different Australian States buy vast domains from private persons and divide them up into small lots. Small farmers engage by preference in wheat and fruit growing, and in raising livestock for milk and meat rather than for wool production. This tendency will necessarily become more pronounced.

Below is given a comparative table of the exports of wool from Australia during the last decade:

1901-02	bales	686 000	
1902-03	»	1 440 000	(drought)
1903-04	»	1 375 000	
1904-05	»	1 595 000	
1905-06	»	1 860 000	
1906-07	»	2 033 000	
1907-08	»	2 066 000	
1908-09	»	2 295 000	
1909-10	»	2 471 000	
1910-11	»	2 322 000	(for ten months)

The exports, calculated in percentage, are divided as follows over the great markets of the world:

	1910-11 —	1909-10 —
England	54 %	51 %
Dunkirk and Calais	19 »	18.5
Bremen	7 5 »	8
Hamburg	7 »	8
Marseilles	0 25 »	0.30
Italy	0.75 »	0.70
America	1.5 »	4 5
Antwerp	9 »	8
Others	1 »	1

A bale of unwashed wool weighs 300 lbs., a bale of washed wool 250 lbs.

The sales during 10 months in 1910-11 represent 70 % of the entire output of Australia, and the Australian markets continue to increase in importance.

The rainy season has been very favourable to the grazing industry in Australia; and a large number of lambs, instead of being sent to the slaughter-houses and the refrigerators, have been kept for breeding and wool-production, while on the contrary in Argentina it is anticipated that there will be no considerable increase of output owing to the unfavourable season.

PIGS.

160 **Foraging Pigs in Oak and Beech Forests.** (Schweineweide in Forsten mit Eichen- und Buchenbeständen). — *Illustrierte Landwirtschaftliche Zeitung*, 31. Jahrgang, No. 90, pp. 837-838. Berlin, 31. November 1911.

In view of the plentiful crop of acorns and beech nuts in 1911 Mr. Arnim-Blankensee recommended that pigs should be driven
Germany into the woods to pick them up. The only question is whether the pigs can stand high degrees of cold without injury.

In connection with this, an experiment carried out by the Municipal Administration of Bunzlau by driving pigs into pine woods should be of interest, though its purpose was not to feed them, but to destroy forest pests. On the 15th October 1906, the Municipality bought 105 Hanoverian country pigs, with, in part, a strong admixture of English blood, and averaging 121lb. in weight. On the 16th November they bought 40 East Prussian pigs of an average weight of 123lb. To shelter the animals sheds made of planking were erected at three points in the wood ; the roof was of pasteboard or planking covered with forest litter. It was found that the sheds had been made over-large and that 8 sq. ft. is sufficient area for a pig. For littering straw was used ; an ample litter may be made during severe frost, and then it will not be necessary to make the walls of the shed very close. Adjoining the sheds a shelter for the pigmen was erected, and in addition a feeding room 15 by 22 feet in size fenced off by planking 3ft. high. In this space the pigs were fed ½ lb. of swill per pig per day, 1 to 2lb. of potatoes and 4 ½ to 6 ½ lb. of carrots. The latter were given to regulate digestion, as the nuts picked up in the forest are binding. The water consumption was small, and a sufficiency could almost always be obtained from ditches with flowing water.

Three pigmen were set to watch the pigs, and it was found that they could look after their herds of 40 to 55 pigs without a dog.

The animals soon got used to forest grubbing, and remained healthy ; only two had to be sold prematurely.

The animals were kept in the forest for a long time without any untoward incident. Not until severe cold (— 18° C. 0.4 Fahr.) set in, in December, did the ration of swill need to be increased, as the carrots and potatoes were frozen. At the end of December the animals were sold for fattening, their average weight being 132 lb.

The costs of the experiment reckoned per acre were roughly 7*s* 6*d* (the area foraged over was 715 acres). The conclusion was less favorable than it might have been under other circumstances, owing to want of experience, the fall of prices for pigs during the period of forest feeding, and also owing to the costs of feed.

It was not possible to ascertain with certainty any reduction in the larvae of injurious forest insects, but on the other hand the forest soil covered had been thoroughly turned over; under more favorable circumstances, putting pigs to forage in forests should commend itself, if only for this reason.

The animals withstood high degrees of cold, remained healthy, and were easily fattened after their forest experience. Though this experiment was not carried out for the purpose of fattening pigs on forest food, it nevertheless furnishes some indications which will probably be of value under other circumstances.

POULTRY.

170 Geoffroy Smith. **Alteration in the Comb of the Hen in Connection with Laying.** — (*Quarterly Journal of Microscopical Science*, vol. LVII, 1911). Abs. *Revue Scientifique*, 49e année, 2e sem., No. 22, p.690. Paris, 25 Novembre 1911.

Great Britain

Poultry breeders have long known that hens' combs do not always present the same appearance ; a considerable increase in size takes place when the period of laying approaches. Mr. Smith confirmed this fact of experience by precise measurements, on young and adult hens, at different times. He thus ascertained that the bulk of the comb is independent of the factors of outside environment; it increases practically to double the size or more during the period of laying, without a simultaneous increase in the weight of the body of the hen.

Mr. Smith found that the growth of the comb is due to a fatty infiltration of the conjunctive tissue of that organ, and he gives the following explanation :

During the time of laying the blood is charged with fatty substances which accumulate in the ovary, where they enter into the composition of the yolk of the egg ; the excess of these substances is deposited in the comb and thus contributes to the accentuation of secondary sexual characters.

171 A. Pézard. **The Determination of Secondary Sexual Characters in Gallinaceous Birds.** (Sur la détermination des caractères sexuels secondaires chez les Gallinacés). — *C. R. de l'Acad. des Sciences*, T. 153, No. 21, pp. 1027-1029. Paris, 20 Novembre 1911.

France

The development of the secondary sexual characters at maturity has for some time been attributed to the influence of the testes, or more precisely to the interstitial gland situated between the seminiferous ducts.

In this connection, experiments were made on 23 cocks: 7 were left as controls and the remaining 16 were castrated, but complete castration was performed on only 10. In these 10 birds the development of the comb, wattles, and ear-lobes was checked, and the

neck and body were more slender; there was, however, no appreciable change in the "phanères", neck-hackles, saddle-hackles, sickle-feathers, and spurs. The castrated birds did not crow or show any sexual desire.

The action of an internal testicular secretion was tested by peritoneal injections of an extract from the testis of a pig in which only the interstitial gland had developed. A Black Orpington capon treated in this way regained its sexual instincts and crow, as well as the disposition to fight; and the comb and wattles increased in size and became full and red. When the injections were discontinued these characters slowly disappeared.

Other experiments on Golden and Silver Pheasants gave similar results.

It appears then that in the Gallinaceous birds the "phanères" are not influenced by testicular secretions, while the development of the head ornaments, crowing, sexual instincts, and combative nature, as well as of some characters of the skeleton, is dependent on them.

L. BRÉAUDAT. **Investigations into the Protecting Part Played by Paddy Bran in Feeding with White Rice.** (Recherches sur le rôle protecteur du son de Paddy dans l'alimentation par le Riz blanc). — *Journal de Pharmacie et de Chimie*, 103ᵉ année, 7ᵉ Serie, T IV. Nº. 10, pp. 447-451. Paris, 16 Novembre 1911 **172**

France

When hens are put on white rice feed exclusively, whether the rice is boiled or raw, it is observed that during about the first eight days they consume from 200 to 500 grammes of the food per 24 hours, according to the individual. Then green diarrhoea results, the appetite rapidly falls off, the temperature drops, and emaciation appears, with drooping condition, hesitant movements and immobility. The quantity of rice eaten drops to 20 - 30 grammes per day, and in the course of the second and third week the animals die in paralysis, with the well known lesions of polyneuritis in hens.

Control hens receiving the same rice together with 25 to 30 % of rice bran, that is to say, the whole of the cellular layers between the pericarp and the albumen, live without any such symptoms and increase in weight.

The methodical enquiries of the writer prove that rice bran protects the animals fed exclusively on rice, and that this protecting part is not due to the gluten nor to the fatty substances, nor yet to the various hydrocarbon or mineral substances in the bran.

A watery extract of rice bran in suitable quantities secures the same beneficial effect, which must be attributed to some other cause.

178 Dr. Ulrich. **The Growth of Different Breeds of Ducks up to the Age of Ten Weeks.** (Ueber das Wachstum von Enten verschiedener Abstammung bis zum Alter von zehn Wochen). — *Deutsche Landwirtschaftliche Tierzucht*, 15. Jahrgang, No. 46, pp. 553-554. Berlin, 17. November 1911.

Germany

Ducks fattened for the table should be very plump and at ten weeks ought to weigh at least 2 kg. (4 ½ lbs). In order to prove how far ducks of different breeds are capable of fulfilling the conditions required by the market, Dr. Ulrich had some eggs of the Pekin breed of duck, of the common duck and of a cross breed (Pekin × wild duck) hatched by hens. 36 hours after leaving the shell, the ducklings were fed with crushed and soaked rice and with Spratt's chicken food. In the course of the second week some wheat bran and maize was added, with finely chopped nettle and salad. At the beginning of the third week, sand, charcoal, and crushed shrimps were also given, and the ration of Spratt's food increased at the same time. In the evening the ducklings were given, besides, some wheat and barley crushed together. Water, was given them to drink, but they were not allowed to swim in it.

The results obtained by this experiment are drawn up in the table below.

RACE	Day when hatched	Number of young birds	Average weight in grams			
			when hatched	July 22	Aug 17	Sept 5
Pekin ducks . . .	21 June 1911	8	50.3	607.5	1966.2	2147.5
Common ducks . .	19 »	13	47.1	506.9	1741.5	1958.4
Cross-bred Pekin × Wild duck .	18 »	7	45.1	714.3	1502.1	1573.5

Under equal treatment the Pekin breed produced a much more considerable quantity of meat, and is therefore to be preferred for fattening purposes.

Cholera-like Diseases occurring among Poultry. — *Nature*, No. 2192, Vol. 88, p. 17. London, November 2, 1911. 174

United States

A *Bulletin* (No. 146) has been issued by the *Agricultural Experiment Station of the Rhode Island State College*, U. S. A., on the cholera-like diseases occurring among poultry. It is shown that, in addition to the well-known micro-organism of chicken cholera, first studied by Pasteur and Toussaint, several other microbes cause similar diseases among poultry, some of which possess extreme power of infecting.

DR. G. LICHTENFELD. **Ostrich Farming: Diseases of the Ostrich and their Treatment.** (1) (Ueber Straussenzucht, Krankheiten der Strausse und ihre Behandlung). — *Der Tropenpflanzer*, 15. Jahrgang, No. 11, pp. 591-605. Berlin. November 1911. 175

Germany

The parasites of the ostrich find more favorable conditions for their propagation in the domestic than in the wild variety. This is particularly true in relation to intestinal worms, and consequently we now have to deal with a tape worm and a nematode which appear as pests in ostrich rearing.

1. The ostrich tape worm (*Taenia struthionis*), besides infesting the ostrich, is met with in Guinea fowl, geese and some other birds. The course of its development is unknown. It lives in the small intestine and injures the bird probably merely by appropriating to itself food substance from the intestinal contents. If several worms occur in one ostrich the yield of feathers is reduced, the bird loses weight, and, if not plentifully fed, may perish. The existence of tape worms may be easily detected through finding sections of the worm in the excrement.

For expelling the worm, extract of male fern, Kamala and other agents are used. The medicaments are made up into pills by mixing with flour, and are given to the birds after a 12 hours' fast. The quantity of the drugs depends on the age of the animal. It is as follows: An ostrich aged:

4 months	is given	10 gm.	Kamala or	5 gm.	Extract of male ferm.
9 »	»	22 gm.	» »	9 gm.	» » »
18 »	»	32 gm.	» »	15 gm.	» » »

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(1) Cf. also: *Bull.* March 1911, Nos. 927 and 929; May 1911, Nos. 1482, 1483 and 1484; June 1911, No. 1851; July 1911, No. 2231; Aug.-Sept.-Oct. 1911, No. 2837. (*Ed.*).

After treatment the ostriches must go without food for some time. The sections of worm passed out must be burnt.

2. The ostrich nematode (*Strongylus Douglasii*) lives as an embryo on damp pasture land and in dirty water. Irrigation of fields is therefore particulary favorable to its propagation. The full-sized worm is about 6 cm. (2.4in.) in length and is protected against the action of the digestive juices by a coating of gelatinous mucus. Like the tape worm, it chiefly causes injury to young auimals, but not by absorbing food from the intestinal contents but by sucking blood. As they fix themselves in large quantities in the glandular part of the stomach, they give rise in addition to severe symptoms of digestive disturbance. The animals attacked become very emaciated, and mostly die if not suitably treated.

For destroying the gelatinous coating of the worms, the birds, after 18 hours' fasting, are given when aged

3 months:	60 gm. Paraffin . .	mixed with the same quantiry of milk.
9 »	150 » » . . .	
18 »	280 » » . . .	

Two days later, and after a renewed fast of 18 hours, the animals are given the following mixture at the age of

	Carbolic acid	Oil of Turpentine	Warm water
3 months	4 gm	11 gm	70 gm.
9 »	9 »	28 »	170 »
18 »	13 »	40 »	250 »

They must be allowed to go hungry for some hours after the treatment, and are then given some grain food but not grass. The worm treatment is carried out after clipping the feathers, to prevent loss of the latter. After treatment the animals must be conveyed to pasturage free from the parasite, so that no fresh infection takes place.

176 **Marking Eggs after Cold Storage.** (Le Marquage des Oeufs conservés par le froid). — *Bull. Mens. de l'Ass. Intern. du Froid.* 2e Année, Nos. 18-19-20, pp. 201-203. Paris, Juillet-Août-Septembre 1911.

Russia

The St. Petersburg Exchange Committee for the Egg, Butter, Poultry and Game Trade has for some time past gone into the question of the effect of speculation on the prices of Russian agricultural produce.

Taking as their basis the resolutions of the IInd International Congress for the Suppression of Fraud, the Committee wishes to induce all countries to accept a marking of cold-stored eggs. A brand would be put on the boxes in the entrepot and this would be a first step towards official recognition of cold-stored produce.

The Provision Trade Section of the London Chamber of Commerce having had this question put before it, adopted the following resolution:

The Section approves the initiative taken by the Russian Chamber of Exports in relation to the measures to be taken for preventing the sale of cold-stored as fresh eggs and it recommends for that purpose:

1) That whenever an egg passes out of a cold chamber, whether in an egg-producing or egg-exporting country, it should be marked indelibly with the words Cold-stored egg."

2) To ensure the application of this measure, it is desirable that an International arrangement be arrived at between all the egg-producing countries.

BEES.

177 J. E. O' GRADY **Lucerne and Honey.** — *Agricultural Gazette of N. S W*, Vol. XX, Part 9, pp 793-799. Sydney, September 1911.

Australia: N. S. Wales

The purpose of this article is to invite attention to the subject of bee culture in those districts of N. S W. where lucerne is now being largely planted for the first time. Every district which produces large quantities of lucerne is specially suited for bees. This is fully demonstrated by the large profits derived from bees along the Hunter and about Tamworth either by specialists or by farmers who make bees a « side line ».

Lucerne provides nectar of excellent quality, of such quality that in the United States, besides being the king of fodder plants; it is also regarded as the most important honey plant of the West. When it is remembered that the visits of bees are essential to the setting of lucerne seed, it will be seen how intimately the two crops, lucerne and honey, are connected.

This plant flowers from November to February inclusive, in New South Wales, and during that period the product of the hives is mostly lucerne-honey. At the Lapstone Apiary at Emu Plains with 156 colonies, the 1911 crop of honey is expected to be of 12 to 15 tons.

As bees travel considerable distances it is not possible to say how much the partnership of bees contributed to the excellent crop of lucerne seed harvested at Lapstone Farm; but certain it is that without bees that crop would have been impossible.

178 **Candied Honey.** — (*Victoria, Australia, Journal of Agriculture*). Abs.: *The Louisiana Planter and Sugar Manufacturer*, Vol. XLVII, No. 14, p. 325. New Orleans, September 30, 1911.

ustralia: Victoria

Clear honey always realizes a better price than cloudy or congealed; producers should, therefore, aim at their honey remaining clear and liquid as long as possible. This may be accomplished by the removal of the factors which hasten granulation, namely, excess of moisture, pollen grains and air bubbles.

When extracting the honey, it should be heated to 160° F. before being poured into a settling tank. This can be done by drawing the honey into 60 lb. tins, and standing these in hot water until the required temperature is reached. · Thus, in the settling tank, air bubbles, pollen grains, and fine particles of wax rise to the surface, while a percentage of water is evaporated at the same time.

In some of the larger apiaries an apparatus for heating the honey is inserted between the honey gate of the extractor and the settling tank, to which the honey finds its way by gravitation. It may be drawn off, while still slightly warm, into tins ready for market.

Honey thus treated remains liquid for many months. If when kept for a long time it does candy, it may be re-liquefied. In liquefying candied honey, great care should be exercised not to spoil it by overheating. The temperature of the water in which the tins are placed should not exceed 170° F.

179 **Beeswax from Northern Nigeria.** — *Bulletin of the Imperial Institute*, Vol. IX, No. 3, pp. 236-240. London, 1911

Nigeria

Seven samples of beeswax were forwarded to the Imperial Institute. They were stated to have been obtained from the Lapai and Zungeru districts of the higher Province of Nigeria.

. The samples contained only small amounts of moisture, ash, dirt and matter soluble in water, and they may therefore be regarded as carefully prepared.

It is understood that large quantities of beeswax are available in Northern Nigeria, and in some cases, in the Zungeru and Lapai districts, rail transport is already available. In view, therefore, of the good prices which the material would realise in London, and the large demand which exists for beeswax in the United Kingdom, efforts should be made to establish an export trade in the product from the Protectorate.

T. BAINBRIDGE FLETCHER. **The Wax Moth (*Galleria Mellonella*).** — *The Agricultural Journal of India*, Vol. VI, Part IV, pp 399-404. Calcutta, October 1911. **180**

The Wax-Moth (*Galleria mellonella*) seems to have been originally an inhabitant of the Euro-Asiatic continent and of Africa north of the Sahara, but is now spread by human agency over practically the whole world. If not an original native of North America, it was doubtless taken there with some of the earliest hives of bees imported from Europe.

India It is said to have been introduced into Australia from Europe before the year 1878, when it was recorded from Queensland, and was first noticed in New Zealand about 1904, having probably been brought in from Austrălia. In India and Ceylon it is common everywhere, being particularly abundant in the plains of India during the rainy season. Throughout the whole area of its distribution, the Wax-Moth is looked upon as one of the major enemies of the apiary. The damage is done wholly by the caterpillar, which tunnels through the bees' combs, lining its galleries with a profuse web of silk. The wax itself seems to form the sole food of the caterpillar, neither the immature bees nor the honey being eaten by it. The life history of the Wax Moth has been worked out by the writer at the Pusa Insectary.

The eggs are laid by night, usually in small clusters containing as many as forty eggs, being deposited always in the comb, in a more or less concealed situation. The young caterpillars escape from the egg by biting out a hole of exit; on emergence they immediately commence to run about very actively in search of a suitable place to tunnel into the wax of the comb After 4 or 5 weeks the caterpillar becomes full grown and spins a white silken cocoon either in the comb on which it has been feeding or in some corner or crack of the hive or its surroundings. The whole life-history of an individual moth covers a period of about 6 to 8 weeks from egg to adult.

Practically nothing can be done to exterminate the moth in India owing to the colonies of wild bees (1), some kinds of which occur almost everywhere and provide the moth with suitable food. In the case also of bees kept in a more or less domesticated condition in walls of houses, earthenware vessels and ordinary box-hives, little can be done without practically destroying the whole comb, as it is not possible to examine the nest properly and check the damage before it has assumed unduly large proportions. The universal prevalence of this destructive moth is one of the strongest arguments for the use of modern forms of beehives in India. Italian bees keep better guard against the Wax Moth than the native Indian bees.

The article is illustrated by a coloured plate of 7 figures.

SILKWORMS.

181 **Silkworm Culture in Russia.** (Die Seidenzucht in Russland). — *Das Handelsmuseum*, Nr. 46, Seite 706-707. Wien, 16. November 1911.

Russia

The silkworm production of the Caucasus (2) in 1910 amounted to nearly 330 000 boxes of eggs and 368 000 poods of cocoons (1 pood = about 35 lb.). The drying of the cocoons is carried out artificially in establishments of the most primitive and simple character.

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(1) There are in India three common kinds of wild honey bees: 1) *Apis dorsata*, a very large species which lives in the hills and the damper regions of the plains, and makes a single large comb which may measure 4 or 5 feet across and which is usually hung under the horizontal branch of a tree or amongst rocks 2) *Apis indica*, a species slightly smaller than the European honey bee but very similar to it This builds several parallel combs, generally in a hollow tree, and is kept in a state of semi-cultivation in some places, notably in Assam, boxes being placed for the swarms of wild bees to occupy. 3) *Apis florea*, a very mall bee which hangs its small single comb in trees and bushes and on buildings. The honey is excellent, but the whole comb is so small as not repay cultivation, especially as this bee sufters badly from wax-moths and is therefore difficult to keep

In the hills, a variety of the European bee is kept at Simla and other places, but this bee does not do well in the plains (T. BAINBRIDGE FLETCHER, A simple Honey-Extractor, *The Agric Journ. of India*, Vol. VI, Part IV, pp. 396-397. Calcutta, October 1911). (*Ed.*).

(2) Cf. *Bull.* July 1911, No. 2236, and Nov.-Dec 1911, No. 3196. (*Ed.*).

In the neighbourhood of Kutais, the drying is also carried out mechanically by improved processes. These methods, which are the ordinary processes in Italy, are likewise in use in Kutais, Kuchi and Samtredi. They furnish an excellent yield, but the costs of installation are high.

The Caucasus exports altogether to Milan and Marseilles, via Batum, nearly 27 000 poods. The rest is treated in Russian spinning mills, which at present number 120, situated mostly at Nucha and Schuscha, and turning out yearly up to 20 000 poods of raw silk from Caucasian, Turkestan and Persian cocoons. The spread of silkworm breeding in South Russia is due to the fact that the Departments of Agriculture, during the last 8 years, have distributed selected eggs to silkworm breeders.

From 1909 to 1911 the demand for these eggs doubled in consequence of the strict measures by which the selection is regulated.

The breeding of silkworms is capable of still further extension in the country, if the selection and distribution of the eggs were better organised.

FISH.

Damage to Fish by Drainage Water from Cultivated Land. (Vergiftung von Fischen durch Abwässer der Landwirtschaft). *Landwirtschaftliche Umschau.* No. 43, Seite 1013-1014. Magdeburg, 27. Oktober 1911. 182

Waters used for fish breeding are often contaminated by liquid drainage from manure, urine, chemical manures, sheep washes and the water used for flax retting. Germar

Though it is true that fresh dung may form a food for fish in ponds or streams, it on the contrary causes much mischief if it runs into waters used for fish breeding, either in a fermented condition or in large quantities.

Chemical manures applied to fields, and a part of which would be carried by water into fish ponds, can cause no harm to the fish, because the injurious substances would then be too small in quantity. 10 grammes of nitrate of soda per litre of water would be required to cause the death of fish. The fertilising of neighbouring fields can therefore have no ill consequences on the fish in ponds.

Sheep-washing water causes no injury in rapid streams; it is on the other hand very harmful in ponds and lakes and watercourses, especially to trout.

Among farm waste, the most dangerous to fish is undoubtedly water which has been used for flax retting, this water causing the death of the fish.

183 Dr. K. MULSOW **A New Brain Parasite in the Carp.** (Ein neuer Gehirnparasit des Karpfen). — *Allgemeine Fischerei-Zeitung*, 34 Jahrgang, No. 22, pp. 483-484. München, 15. November 1911.

Germany In the examination of carp fry in the Biological Fisheries Station in Munich, Dr. Mulsow found in the brain of this fish a parasite hitherto not described, belonging to the Myxosporidia. Dr. Mulsow gives it the name of *Lentospora encephalica*. The parasite was only found in the brain, chiefly in the large blood-chambers in the base of the mesencephalon. It has an elongated wormlike shape with circular section. Its body contents are distinctly divided into ectoplasm and endoplasm. The latter contains many granules of different forms, including a number of small cell nuclei and the resistant spores. These spores are nearly spherical and show no vacuoles. The diameter is 5 - 5.5 μ ($1 \mu = \frac{1}{1000}$ mm.). For the present, little can be said as to the danger presented by the parasite, a point on which further observations will throw light

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS.

184 BALSTER. **Trial of a New Motor Plough at Kurzig, Kreis Meseritz, Prussia.** (Vorführung eines Motorpflugs in Kurzig, Kreis Meseritz). — *Maschinen-Zeitung*, 9. Jahrgang, No. 21, pp. 243-244. Berlin, 1 November 1911.

Germany The March Agricultural Machinery Company carried out a trial on the estate of Kurzig, of a new motor plough, consisting of the motor vehicle and a 5 - share plough. The car weighs 3 900 kilogrammes (3 tons 17 cwt) and its motor develops 50 to 65 H. P.

The trials were carried out with two descriptions of plough, one weighing 1 800 kg. (1 ton 15 cwt) for a vary compact soil; the other weighing only 500 kg. (10 cwt.) for a light soil. Working ten consecutive hours, this machine ploughs 6.25 hectares (15 ½ acres) to a depth of 25 cm. (10 in.), and 10 to 11 hectares (about 25 acres) superficially.

For deep ploughing the consumption of petrol is 15 kg. (33lb). per hour. The plough is able to work without difficulty on slopes of 10 in 100, and otherwise answers all requirements. The motor vehicle can haul up to 10 000 kilogrammes (10 tons) on a paved road. It can also be used as a source of power for stationary engines.

Steam Ploughing. — *Le Cultivateur du Sud-Centre*, 34ᵉ année, N°. 134, p. 682. Rodez, 16 Novembre 1911. 185

France

Steam ploughing has during the past few years grown to very great importance in the region of the beet farms in the Ile-de-France (round Paris).

Last year there was founded at Soissons a steam ploughing company with a capital of 100 000 francs (£ 4 000), divided into 20 shares of 5 000 francs each, belonging to 10 growers, who represent a cultivated area of 2 200 hectares (5 440 acres).

The plant consists of two Fowler 85 H. P. road engines, fitted with 650 metres (710 yds) of cable, a 4-share plough, a 6-share plough, a 24-tooth scarifier, one harrow, two water casks and a roller.

In 5 months the area ploughed was 458 hecatares (1 142 acres), that is, 4.25 hectares (10.5 acres) per day of work. The men engaged on the work number 6.

The results of the first financial year were highly satisfactory. Ten neighbouring farmers joined the first ten; they undertook to supply 640 hectares (1 500 acres) of work. The Company doubled its capital and bought a second Fowler engine.

A second Company has just been founded at Plessis Belleville (Oise); it began operations on the 1st September; its capital, as at Soissons, is 100 000 francs divided into 20 shares of 5 000 francs each, and each shareholder guarantees 25 hectares (75 acres) during 10 years.

The following is the scale of charges for work :

	per ha.	per acre
Ploughing 15-22 cm. (6-9 in) deep	60 fr	19s. 6d.
» 25-30 » (10-12 in.) »	70 »	22s. 9d.
» 28-30 » (11-12 in) and subsoiling to a further 15 cm. (6 in.) . . .	80 »	26s.
Harrowing	5 »	1s. 8d.

The shareholders are allowed 10 % on the amounts to which they subscribe ; the rest is according to the general tariff.

The water required for feeding the boilers is delivered free of charge to the engine by the farmer. The Company supplies the whole of the complete steam ploughing plant, and also the engine-drivers and other operators.

186 L. Bakgeron. **Accidents to Workmen due to the Straw - Trussers Attached to Threshing Machines. The Jonville Appliances.** (Accidents du travail dus à la botteleuse adjointe aux machines à battre. Les appareils Jonville) – *Journal d'Agriculture Pratique*, 75e année, T. II, No 44 Paris, 2 Novembre 1911.

France

The author records the numerous accidents occurring each year during threshing owing to the want of care on the part of employers as regards protection of inexperienced people against belts, pulleys and gearings. Many accidents due to the carelessness of the workmen might be avoided by the use of preventive contrivances, such as the automatic gearing, which prevents the upper limbs being drawn between the drum and the concave.

Mr. Bakgeron quotes in particular the many accidents occurring in the Department of the Nord with the straw-trussers attached to threshers to obviate tying the straw by hand. These accidents arise almost always from the untimely starting of the gear at the moment when the workman is about to pass the string into the eye of the trusser or examine some part which has got out of order.

If the stop pin be not put in, an accident may likewise happen owing to unexpected starting. It is evidently important therefore to provide for the automatic locking of the gear in the position of disengagement, whenever it has been put out of gear.

This is the object aimed at by the device patented by M. Jonville, a working engineer at Wez-Macquart, near Armentières (Nord), which deserves to be pointed out in the common interest of workmen and employers. The latter, by adopting it (or any other serving the same purpose) will prevent the constant increase of their insurance premiums. The writer gives a complete description of the appliance, together with a detailed drawing from which its mode of operation may readily be understood.

To prevent the accidents due to ejectors and occurring to workmen approaching the front part where the trusses of straw emerge, Mr. Jonville, to complete his invention, has built a tilting grid on rollers, which is fitted on the cap of the trusser and prevents any involuntary contact with the ejectors.

J. G. Mc. Millan. **Machine v. Hand-Milking.** — *Agricultural Gazette of N. S. W.*, Vol. XXII, Part 10. Sydney, October 1911. **187**

Australia

In Victoria when acting as travelling Instructor for five years and as Dairy Instructor at the Hawkesbury College for the past three, the writer had good opportunities of drawing certain conclusions on the question of milking by machinery as against hand-milking.

At the Hawkesbury Agricultural College a short test was made with eight cows for two weeks, divided into two sections, one lot milked by hand the first week and by machine the second, and vice versa. The results of the tests are given in the following table :

Cow N.°	May 8th to 14th inclusive Machine-milked		May 15th to 22nd inclusive Hand milked	
	Milk lb.	Fat lb	Milk lb.	Fat lb.
29	169.75	5 4555	168.5	4.9345
304	189.5	8.212	186.0	7.4825
188	117.0	4.0403	108.5	4.031
65	143.0	4.8472	144.5	4.2332
Total	619.25	22.555	607.5	20.6852
Average yield	154.8	3.64 %	151.87	3.45 %
	Hand Milked		Machine Milked	
47	130 5	4.757	98.25	3.479
145	177.5	6.392	142.0	4.9412
19	102.0	5.323	77.5	3.8975
70	144.0	5.430	116.25	4.281
Total	554.0	21.902	434.0	16.5987
Average yield	138.5	3.95 %	108.5	3.82 %

Milk yield for seven days immediately succeeding end of test

Cow N.°	Milk lb
29	154
304	182
188	91
65	128
47	79
145	119
19	59
70	101

There was a somewhat greater decrease of milk during the period of machine milking than in that immediately preceding the change Allowance must also be made in the tables for the natural decrease due to nearing the end of the lactation period; cows Nos. 47, 19, and 70 having been in milk for seven or eight months.

At the Hawkesbury Agricultural College there are cows that have been milked continuously for five years by the machines without any noticeable effect on the quantity of the milk from year to year.

Cows that were milked for two years by machines and then by hand are still milking well; and others milked by hand and then by machine are milking on the whole, satisfactorily.

Certainly there are individual cows that, owing to their peculiar temperament are unsatisfactory.

It appears that machine-milked cows continue longer in milk than others, and are generally more difficult to dry off.

This is also the experience of other dairymen The machines have been in use at the Hawkesbury Agricultural College for nearly nine years continuously The percentage of fats and other solids in the milk drawn by the machines is as high as that drawn by hand as shown from weekly analyses of College milk.

The action of the milking machine was not found to have any ill effect upon the health of the cow; nor is the form, texture or quality of the udder altered. Allegations have been made against the machine that it is a transmitter of diseases peculiar to the mammary glands.

At the College there have been fewer cases of mammitis among machine-milked than among hand-milked cows There is also every reason to believe that where thorough cleanliness is practised, a first-class dairy product can be obtained, even better than with hand-milking under allied conditions

The general rule where milking machines are used is to work them for only about eight or nine months of the year. Practical dairymen consider that it is hardly worth while to work the machines when the cows are drying off. The cost of running a two-machine plant for the milking period with an oil-engine as power is about 1 *s.* 4 *d.* per day in the busiest season When steam power is used the cost is much the same where wood is cheap; but where there is a scarcity of fuel the oil-engine is generally found cheaper. To obtain accurate results comparable with those of Hawkesbury College the writer made some inquiries from two well-known Victorian dairymen, Messrs. Hennessy, of Bena, and Eccles of Glenormiston.

The former uses steam power, and states that the actual cost of running two machines for the season of eignt months is £3 2 *s.* for renewals, and £12 7*s.* 6*d.* for fuel. The actual time of milking seventy cows was four hours per day. Mr Eccles states that it costs him 1*s.* per week for each machine to milk seventy cows. The oil-engine costs him 7*s.* per week during the busy time; and 5*s.* per week during the slack. The cost of a two-machine plant, including vacuum pump, boiler, engine etc will be from £170 to £180. An oil-engine plant, in addition to a small boiler for generating steam for cleansing purposes, will cost somewhere about the same. It would be evidently unfair to make a charge for interest and depreciation against the milking side of the dairy entirely, because the engine and boiler can be used for other purposes. Allowing a total depreciation of 10 per cent and charging about 7/10 of that against the milking machines, and also about 3 % on the capital invested, it can be estimated that there is a saving of 10*s.* to 12*s.* as a minimum estimate in the cost of milking a cow in a season, in favour of machine-milking as compared with hand.

An improvement might be made so that by some automatic arrangement the amount of milk from each cow could be recorded with less trouble than is now the case with the double machine. On account of the time required in weighing the milk with double machines, the writer would advise the use of the single milkers, believing that the process can be done more quickly. Finally he says that in working milking machines the owner of the dairy or some interested person should be in control, otherwise the best results will not be obtained.

HEARD. **Agricultural Machinery in Bulgaria.** — *The Board of Trade Journal*, No. 781, p. 324. London, Nov. 16, 1911. **188**

Agriculture in Bulgaria is assisted by the Agricultural Bank and its provincial agencies, which supply machinery and ploughs **Bulgaria** on easy terms. In the case of larger machinery, farmers co-operate to purchase threshers and reapers, which are provided by the bank for 40 per cent cash, the machines themselves being the security for the remaining 60 per cent. The Agricultural Society and the Magasin National of Sofia provide machinery on similar terms, most of it being ordered in Austria-Hungary and Germany.

According to statistics published in 1909, there were at work throughout the country 398 000 native and 84 000 modern ploughs, 761 drills, 4156 reapers, 611 threshers, and 73 700 other agricultural machines.

189 **Agricultural Machinery in Russia.** — *Diplomatic and Consular Reports,* No. 4781, pp. 1-104. London, September 1911.

Russia

The manufacture of agricultural machinery has made steady advance in Russia during the last 15 years.

The total value of Agricultural Machinery made in Russia was:

In 1894	£ 720 000
» 1905	» 1 900 000
» 1906	» 2 100 000
» 1907	» 2 530 000
» 1908	» 3 000 000
» 1909	» 4 200 000

The increase in the output of Russian factories received no check from the partial failure of the West Siberian harvest in 1908, but has continued.

The Briansk Company (Bieshitza) employs now 1200 men in its agricultural department, and the Kharkov Locomotive Works is increasing its output of ploughs and harrows. In the year 1908 there were 500 establishments classed as factories for agricultural implements. Their output is shown below:

Ploughs	392 248
Machines for broadcast sowing	8 844
Drills	30 969
Reapers and mowers	61 424
Threshers	22 554
Horse-power engines	22 853
Winnowers and screeners	31 555

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(1) Cf *Bull.* Nov. 1910, p. 148; and Aug.-Sept.-Oct. 1911, No. 2936. (*Ed.*).

An increase of import duty for agricultural machinery might raise the price to the purchaser, but it would probably not shut out the foreign article. The reason for this is that agricultural machinery is sold on a long credit. At present the money which this represents is (practically) lent by the foreign importer. It probably amounts to about £.5 250 000

It is unlikely that such a responsibility can be borne by the Russian manufacturer, so that the help of the foreigner would still be needed, only the price paid by the farmer would rise and fewer machines would be bought. The Imperial receipts might, or might not, rise, but agriculture would be made dearer for farmers, some of whom would be held back from buying machinery. This would conflict with the policy of general development of the land.

Agricultural Implements for Siam. (Landwirtschaftliche Maschinen). *Das Handelsmuseum*, No. 44, p. 668. Wien, 2 November 1911. **190**

Siam

The peasants in Siam who prepare the soil for rice cultivation dig 4 inches deep, while in the lands of the State Experimental Agricultural Station tilling for the same culture goes to a depth of 10 in This method yields an excess of 33 % over the best harvests obtained by the natives This proves that the ancient systems of native cultivation by no means give a yield in relation to fertility, both in point of quantity and quality of the products.

The plough drawn by a buffalo cannot penetrate deep enough into the soil, and furthermore it is absolutely useless during the dry season, which renders tilling very difficult. Enormous and rich cultivable regions lie waste for want of working

All this could be remedied by using suitable agricultural machinery. It is certain that in the early future Siam will be a good market for agricultural machinery, and particularly for steam and motor driven ploughs, threshers, binders, pumps, etc.

BUILDING-CONSTRUCTION.

The Chaff Stack Pole and Netting Silo. — *Agricultural Gazette of N. S. W.*, Vol. XXII, Part 9. Sydney, September, 1911. **191**

Australia

Between the wooden or cement silo which is expensive, but ensures a maximum percentage of palatable silage, and the open stack, which is cheap, but involves considerable waste of material, Mr. Sylvester Browne of Singleton has evolved and patented a new pole and netting silo, for chaffed cornstalks, sorghums, or any green crops; an illustration of it is given.

The only materials used in the construction of this silo are either poles cut from the forest and sunk about 1 ft. in the ground, or sawn timber studs; and let-in plates, 6 in. by 2 in, laid flat on the ground. The only inside lining used is ordinary 1 ½ inch wire rabbit netting, stapled on the poles or studs. The outward pressure of the silage is met by the wire-netting; while outside are bellybands of common No. 10 fencing wire, two for each 10 feet section. The roof is designed to lower inside by weights outside, on rollers. The silo reproduced in the illustration is built with sawn studs from the local mills and the total material used to make it for holding about 90 tons of corn ensilage was under £ 15.

A roof taken from an American plan was afterwards put on at a cost of £ 6 15 s, bringing the cost of the silo holding 90 tons chaffed corn silage up to about £ 21. A silo built on these lines to hold 250 tons of chaffed corn or other silage should not cost more than £ 40. The silage, when set, does not allow rain to get in at the sides; and in chaffing corn and blowing it in with an Ohio chaff-cutter and blower, the flag is carried to the sides of the netting, making a kind of papier-maché rainproof covering. An inspection of the silage in this silo, when it was being emptied, showed that there was a layer of from 6 inches to a foot on the outside which was quite bad and in this respect it compares badly with cement or wooden silos; but, on the other hand it can be cheaply made, and there is no doubt it gives better results than the stack.

The silage, other than the outside layer, was of excellent quality; in fact, just the same as if it had been made in a cement or wooden silo.

RURAL ECONOMICS.

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E. LANGENBECK. **The Circular Enquiry by the " Deutsche Landwirtschafts-Gesellschaft " in relation to farming in Germany.** (Die Betriebsumfrage der Deutschen Landwirtschafts-Gesellschaft. Sonderabdruck aus den Arbeiten der D. L. G. Lehrgang Eisenach.)

Germany

The author sets out succinctly the object aimed at by the "Deutsche Landwirtschafts-Gesellschaft ,, in its enquiry into the economic status of husbandry in Germany, and the measures adopted in carrying it out, the extent of the enquiry and its present condition.

With regard to the reasons which prompted it, the Author states that in jointly interested spheres the need was felt for gathering with some rapidity reliable data as to the economic position and organization of farms at the present time, to serve as the material for the creation of a rural economy which would be more directly in contact with actual conditions. An experimental science such as rural economy can really only supply useful information on condition that it is rooted in concrete practice. In saying this we are far from wishing to disparage the value of the deductive method of enquiry, but this method only supplies data of indisputable value when it takes as its point of departure well grounded premises, which, by logical inferences. will lead up to unassailable principles.

The practical task of rural economy has become more and more difficult, above all owing to the dearth and high cost of labour. Hence the necessity to work out its principles in a very clear and evident form, in order to prevent the principle of pure economy being brushed aside by the natural endeavour to attain the maximum of gross-production, an endeavour which is in itself one-sided and defective, although in some sort sustained by the present great development of the means of production. Technical progress and means of communication have generally allowed of a more intense practice of agriculture, and have multiplied the forms of internal organisation, imparting more flexibility and elasticity to them. The problem of labour, moreover, is exercising an ever greater influence on this organisation.

On this subject there are exceedingly valuable monographs and studies, but hitherto there have been no materials capable of supplying precise general knowledge as to the way in which German agriculture has little by little adapted itself to new conditions under the influence of local circumstances ; this is the gap which the D. L. G. proposes to fill by organising its agricultural enquiry on a rigorously uniform method. The data collected hitherto comprise material covering a period from 1898 to 1905 and particularly the years 1900-1905.

In the following table the 456 agricultural undertakings with which the enquiry was concerned are divided into four categories according to their extent :

	Number of Farms	%
Farms from 2 to 5 hectares (5-12 ½ ac.) . . .	14	3.0
» » 5 to 20 » (12 ½-50 ac). . . .	148	32.5
» » 20 to 100 » (50-250 ac.)	237	52.0
» of over 100 » (250 ac)	57	12.5

It is not always possible to secure particulars covering at least three years of working, as had been decided beforehand. Whenever the data supplied by the collaborators seemed uncertain, the endeavour was at least made to secure an exact description of the estate, in the absence of particulars concerning the management, because this description itself may supply valuable information on the economic results of farming in relation to certain factors of production, such as the position of the farm, its organisation, the list of livestock for breeding and working, and the labour.

Of the 456 farms, 287, *i. e.* 63 %, supplied data as to their working for a period ranging from one year to six years and above.

In 157 of the above 287 farms, *i. e.* 54 % of the cases, particulars are supplied by an Accounts Department from books properly kept. This result, which is far from being satisfactory, will bring out clearly the necessity of procuring in future more reliable data as to the working, while continuing to gather exact descriptions of a large number of farms and information as to their organisation and the amount of the capital invested. Then the practical results of the enquiry organised on so extensive a scale may be proportionate to the expenditure of time and money involved by the enquiry.

Suffice it to say that the expense incurred by the enquiry for each of the 456 farms has averaged up to now 93.50 marks (£4.11*s* 6*d*).

This study is to cover the whole of Germany, and use was therefore made of the political division into provinces, divisions and districts. Allowance was nevertheless made for regions with clearly defined charateristics, giving rise to special forms of farming, such as the sugar industry, distilleries, &c.

With a view to making the materials homogeneous, special forms were used, in which the questions submitted to the farmers were clearly defined, as well as the figures and information asked for. In addition, acting on the experience of previous years, there was sent out in 1908 a circular giving further explanations as regards the way in which the most important questions were to be answered (Hinweise zur Durchführung der Betriebsumfrage). The above forms consist of 9 parts and contain 62 different questions concerning the organisation of the farms. The first four parts relate to the climate and soil and also to the means of communication within and without the farm, thus forming the whole of the natural factors. The other parts of the form relate specially to the organisation of the farm itself, containing particulars regarding the rotation of crops, manuring, animal and mechanical power and labour, the quantity and quality of draught animals, in relation to the work they have to carry out; the quality and quantity of agricultural machines and the auxiliary industries which may be carried on. The sixth part is devoted to the administrative data set out in the tables, comprising income and expenditure, gross production, consumption, produce and sales. The seventh part gives the total value of the farm and the capital invested therein; the eighth part is concerned with the system of book-keeping adopted, and the last part gives us the estimate of profit and loss for each working year.

The different collaborators in the enquiry must therefore make use of the statistical method to give a general table of the economic conditions of the farming industry in the zone which each of them is called upon to investigate.

Though it may be true that the different monographs are insufficient in most cases to arrive at general conclusions as to the principles regulating the agricultural economy of a given region, nevertheless a knowledge of the conditions in which the farming industry in different zones is conducted, is of the very highest interest in farming practice.

Every effort has been made, but fruitlessly, to extend the enquiry to the whole of Germany, and many regions in South Germany still await investigation. It is to be hoped that the number of collaborators in this enquiry will increase in keeping with the really very great importance of the problem to be solved.

198 PAUL GUTKNECHT. **Studies on the Technical Organisation of Agriculture as Carried on in Börde and the Adjoning Districts under the Influence of Intensive Cultivation of Hoed Crops.** — *Studien über die technische Organisation der Landwirtschaft in der Börde und in den angrenzenden Gebieten unter dem Einflusse des intensiven Hackfruchtbaues.* pp. 1-84). Berlin.

Germany

In this work the author lays down the results of investigations made by him on forty typical farms in the Börde, whose special feature is the intensive culture of sugar beet. The zone studied includes part of the political district of Magdeburg, on the left bank of the Elbe, as well as those parts of the duchies of Anhalt and Brunswick bordering on this river. All the figures quoted were verified on the spot by Mr. Gutknecht himself and are given in the case of 34 farms after the most careful examination of accounts.

In the course of his study, the author attributes special importance to climate and soil, the two chief factors in determining the organisation of agricultural enterprise; and he is of opinion that the poor returns given by a large number of such undertakings depend, in the majority of cases on having given primary attention to the means of production without taking due account of these two factors.

Soil and Climate.

The total area of these forty farms is 15 320 ha. (37 856 ac.). This is made up of 229 ha. (566 ac.) of sand; 429 ha. (1 060 ac.) of clay; 315 ha. (778 ac.) of peat; and 224 ha. (554 ac.) of calcareous soil; while the remaining 14 522 ha (35 684 ac.), or over 94 %, may be classed as loam (Lehm); of the latter, the remarkably large proportion of 70 % — 10 313 ha. (25 484 ac.) — is a kindly humons loam, or true Börde soil, 1 800 ha. (4 448 ac.) are sandy loam, and 2 409 ha. (5 952 ac.) are heavy loams, though containing as much humus as the true Börde loam.

The mean annual temperature of this zone during the five years of study may be calculated it 8.8°C. (47.8 Fahr.) with a mean of 0.5° (32.9 Fahr.) in winter; of 8.8° (47.8 Fahr.) in spring; of 18° (64 4 Fahr.) in summer; and 9 75° (49.5 Fahr.) in autumn. As to rainfall, three out of the five years must be considered as dry, with rare instances of precipitation during summer; and also as quite abnormal as regards the distribution of the hours of sunshine during the different months.

Position and Communications.

The organisation of a system of intensive culture is closely connected with its relative position and with external means of transport. In cultivating sugar-beet, facility of communication with the factory is of the highest importance, especially when the residue of the manufacture is to be returned to the farm. Twelve out of those investigated have the factory close at hand; five are 3 km. (under 2 miles) from it, six at a distance of 5 km. (3 miles), six at 8 km. (5 m.), three at 10 km. (6 ¼ m.), and two at 12 to 13 km. (7 ½ to 8 m.). The other farms, being 40 km. (25 m.) away from the factory, have to use the railway as a means of transport.

This study of the question shews that a distance of from 3 to 5 km. (2 to 3 miles) is of no great inconvenience, but that only exceptionally favourable conditions for production can justify a distance of 8 km. (5 m.) when animals have to be counted on as the only means of transport.

Subdivision of Property.

From the point of view of subdivision of property the Magdeburg-Brunswick district occupies an intermediary position between the eastern part of Germany where vast estates predominate, and the southern and western parts where smaller estates are in the majority. This region constitutes the principal part of the large and medium-sized estates (Grossbauerngebiet) of Central Germany.

Of those farms investigated, nine have an area of from 50 to 100 ha. (125 to 250 acres) six from 100 to 300 ha. (250 to 750 acres); the greater number, about 23, come under the heading of large estates. The tendency in this zone is to enlarge the estate or add rented land to it. For this purpose very high prices are paid, and the small landholders get the advantage of this demand. But it is a mistake to suppose that large estates are more fitted than small ones to cope with the exigencies of industrial production. For this study brings out the fact that the greatest success attends an enterprise of the kind when superintended by the proprietor, and in which he himself takes an active part, sharing the manual labour entailed.

An enterprise of this kind on a large scale is entrusted to persons of known capacity, with capital at their disposal, and capable of turning to account all the improvements of modern science and agricultural technique.

Crops.

Both climate and soil are so highly suitable for the cultivation of cereals and hoed crops that intensive culture is more justified here than in any other zone. Meadows and pasture lands are excepted *a priori* for want of sufficient rainfall.

The total area of the farms investigated is 17 238 ha (42 596 ac.) 91 % of which is arable and 5 % meadow-land. This disproportion is explained by the fact of farms having been selected as typical of intensive agriculture.

The forage given consists of the residue of the hoed crops and the straw of the cereals, Out of 3 or 4 ha., one at least is given up to sugar-beet and half of the average product of 360 qls. per ha. (14 tons 6 cwt. per ac.), obtained by the cultivation of beets, returns to the land where it is used as forage. When dried this residue represents 7 % of the crop. By adding from 160 to 240 qls. (6 ½ to 9 ½ tons per ac) of leaves, which when dried lose 4/5 of their original weight, a total of 60 qls. per ha. (2 tons 8 cwt. per ac.) of dry fodder is obtained; and though it may be true that this quantity is inferior in weight to the production of meadowland, yet in this zone it is superior in value from an alimentary standpoint.

The wooded area is infinitesimal in extent. There are two farms in which the forest represents 15 % of the total area, but in all the others it covers but a very small surface. But from the economic side, the forest has nevertheless exercised a beneficial influence over the enterprise, by promoting the utilisation of draught oxen during the brief periods when the frozen soil cannot be worked.

Cultivation and Manuring.

In the 40 farms examined, hoed crops occupied 36.8 % of the total arable area, while beet occupied 24.4 %. For this kind of cultivation the soil is ploughed to a depth of at least 30 cm. (12 ins.) in all the farms except two, which, on account of the pebbly nature of the subsoil, are ploughed to a depth of 25 cm. (nearly 10 in) for beets and 20 cm. (nearly 8 in.) for other crops. In the case of preparing soil for the sowing of cereals the multiple (mostly three shared) plough is used, drawn by four horses or oxen. The steam plough is only used in places where the number of animals convenient to keep is not sufficient for carting the beets and at the some time ploughing the soil in time for use. But this plough is sometimes used for deeper ploughing or to render the soil more manageable for the horse-plough. In the majority of these farms, all cereals except rye are hand-hoed or horse-hoed; for this reason the drills are 24 cm. (9 ½ in.) apart. Beets are horse-hoed, and hand-hoed three times.

In nearly all these farms one third of the arable surface is dressed every year with farm-yard manure at the rate of from 200 to 400 qls. per ha. (8 to 16 tons per ac.). Green manuring is chiefly used in the district of Börde; after rye and early potatoes, it is used as a preparation for beets, and always with excellent results. The application of lime to the soil is considerable, since 8 or 10 % of the weight of the beets supplied to the factory returns to the land in the form of lime-refuse from the refining. Nitrates and phosphates are also used on a large scale. Potash is chiefly employed in the Börde district where green manuring is more largely practised.

Rotations and areas cultivated.

In the farms investigated the crops grown may be roughly classified as follows:

53.4 %	Cereals.
3.6 %	Green Crops (Blattfrüchte).
38.0 %	Hoed crops properly so called, of which 28.4 % are sugar beets, and those grown for seed, as well as other seeds and chicory
4.6 %	Fodder crops.
0.4 %	Bare fallow.

Of Cereals:

42.6 %	Wheat.
8.6 %	Rye.
24.3 %	Barley
23.4 %	Oats
1.1 %	Mixtures

A common characteristic of these farms is the intensive culture of hoed crops. which explains the high class of cereals obtained.

The following are the two rotations most commonly in use:

1 Potatoes	1 Beets
2 Beets	2 Wheat
3 Barley	3 Barley
4 Beets	4 Beets
5 Wheat	5 Wheat
6 Barley	6 Barley

Even in places where no definite rotation is followed there is always a tendency to alternate cereals with hoed crops, green crops, or clover.

The average production of all the farms is given in the following table:

	Qls. per ha.	Cwt. per ac.
Winter wheat . . .	30.23	24.06
Spring wheat. . . .	30.16	24.01
Rye	24 04	19.14
Barley	28.09	22.36
Oats.	30.52	23.30
Rape-seed	14.54	11.57
Beans	23.64	18.82
Peas	19.68	16.66
Beet seed.	24.15	19.22
Sugar beets	334.07	266.9
Potatoes	177.45	141.25
Chicory.	300.38	239.1
Mangolds.	473.58	377.0

Live stock

The stock of cattle kept is in strict proportion to the large amount of beets cultivated, because, as we saw, the latter furnishes the largest part of the food required. Food of the kind is hardly suitable for breeding-cattle, even when supplemented by concentrated foods, oil-cake meal, etc.: but on the other hand it is most suitable for fattening purposes and for draught-cattle. In the long run, however, its effects on cattle are detrimental, so that farmers are continually obliged to renew their stock if they wish to avoid serious losses. The more the cultivation of beets spreads and the wider the use made of their residues for feeding, the more does this necessity make itself felt.

The average quantity of cattle kept for the working of these farms may be estimated at one head of heavy cattle per 1.47 ha. (3.6 acres) of arable land or per 0.56 ha. (1.4 ac.) of land under hoed crops. By a head or a unit of heavy cattle is understood one bull, one milch-cow, one ox either for draught or fattening purposes One horse = 1 1/3 unit; a foal = 2/3; a calf = 1/2; a large or medium-sized pig - 1/4; a sheep = 1/10.

Draught animals,

This system of cultivation uses up an extraordinary number of horses. The loss incurred in this way, taken as depreciation in value at the of the year, varies, during an average of 5 years, between 5.4 and 8.5 marks per ha. (2*s* 2*d* to 3*s* 5*d* per ac.) of arable land, and between 84 and 190 marks (£ 4 4*s* and £ 9 10*s*) per head. A few years ago the majority of working oxen were changed every year; now, on the contrary, farmers content themselves with replacing ⅓ or ¼, which are quickly fattened and sold. An exact notion of the loss incurred on draught oxen is given by a farm that sells them as soon as ever the heavy work is over: the loss was 83.8 marks (£ 4 2*s*) per head, *i. e.*, 18.5 marks per ha. (7*s* 3*d* per ac.) of arable land.

Milk, Meat and Wool.

As regards milch cows, seven farms undertake milking, eight use them for breeding, thirteen carry on a small milk trade at the local market, nine rear part of the produce, and two only keep what cattle are strictly necessary, Even in places where milk is more profitable, analysis confirms the well-known fact, that if the price of milk is not higher than from 10 to 11 pfennig a litre (5 ½*d* to 6*d* a gallon), it can never come to be a lucrative business. This does not alter the fact, however, that under wise management and with judgment in purchasing the cattle, it is possible, even at such a price to get manure from milch cows at a good profit, though the question has again been disputed recently.

But Herr von Nathusius (1) came to this same conclusion, settling his account of milch cows not with a profit, but with a price of manure-production on his farm; this price is 62 pfennig per quintal (6*s* 3*d* per ton), whilst, in accordance with the current price fertilisers, an equivalent amount of manure would cost 9 pfennig (11*d* per ton) more. But none of the farms investigated obtained a like result.

The same holds good of cattle for fattening purposes. Only in very rare cases, when for instance a low rate of purchase is followed by a rise in the price of meat, is there any profit worth mentioning. Farms which suffer least from loss in their milk trade are no less successful in fattening their cattle. This confirms the principle that cattle-rearing, to be a success, must be superintended by one to whom it is an absorbing interest, or who is specially fitted for it, especially when it is of paramount importance to rear cattle fit for field labour,

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(1) *Die Rentabilität der Viehzucht-und Nutzviehhaltung im intensiven Landwirthschaftlichen Betriebe.* Vortrag gehalten von Rittergutsbesitzer von Nathusius-Hundisburg in Magdeburgischen Verein fur Landwirthschaft

Sheep too are an important feature. With the exception of a few farms which rear pure-bred merino sheep, as well for their wool as for reproduction, the majority make fattening their one aim. The alternation in the price of sheep in different years is again seen in the ultimate profit from rearing, which is only represented after a good year by the manure produced at a good price. Farms which use Howard's method of book-keeping balance their pig-breeding account with a loss

Judging from the preceding statement, it would seem that the results of live cattle rearing are, as a whole, very unsatisfactory. Even with an excellent stock of animals one must reckon on very appreciable losses. One is inclined to doubt whether the Howard system of book-keeping may not exaggerate these negative results: but it is none the less true, that the result of this industry means, in any case, a more or less lucrative production of manure. And the farms given up to the intensive culture of beets must henceforth be content with this result. As to live stock-rearing the facts hitherto gathered concerning it are insufficient for the formation of a definite opinion

Auxiliary Industries.

Various other industries are carried on in many of these farms, on the organisation of which they exercise the greatest influence.

In certain large enterprises of the kind, these auxiliary industries play so important a part as almost to put the main industry in the background; and they constitute the chief source of revenue for some of the smaller farms, so as to justify one in considering them as the factor on which the working of the agricultural enterprise of a whole region depends. German agriculture undoubtedly owes much to beet-growing; especially as regards more intensive agriculture, good rotation of crops, abundant production of cereals and large revenues. At the same time the cultivation of the crop has also aggravated some of its evils, especially those most generally felt at the present day: such as the enormous sunk capital and the abnormal condition of labour.

Besides the sugar-beet industry, distilleries and other less important industries, such as the drying of beet leaves, are growing in extension.

Labour and Wages.

The writer, in numerons tables, has given the figures relating to labour and its remuneration: the daily and yearly payment received by the different categories of workmen, including the manager and staff.

The wages of ploughmen are about 700 marks (£35) a year. Women are paid at the rate of about 1 mark (1*s*) during the winter and 1.5 marks (1*s* 6*d*) per day during the summer at harvest-time. Men's work is counted as about 1.8 times that of women, and that of boys as 1.4.

Draught animals.

The farms may be divided into three groups: Class I, farms covering at the most an area of 100 ha. (250 ac.); Class II, farms covering at the most an area of 300 ha. (740 ac.); and Class III, farms of more than 300 ha. Then the area and the cattle employed on it stand in the following relation:

Class I. — To one horse, 9.1 ha; to 1 ox, 13.3 ha; for the work of 1 horse 6.8 ha. and the transport of 12 tons of beets over 1 kilometer.

Class II — To 1 horse, 14.3 ha, to one ox 9.5 ha; for the work of 1 horse 8.2 ha. and the transport of 25 tons of beets over 1 kilometer.

Class III. — To 1 horse 20.3 ha., to 1 ox 6.6 ha; for the work of 1 horse 8 ha. and the transport of 20 tons of beets over 1 kilometer.

The number of draught oxen increases with the increase of the area of the farm, while that of horses diminishes. The need of work on the large farms is apparently less, because machines take the place of so much animal labour. Out of 12 975 ha. of the large farms, 3 270, or 25 %, were ploughed in this way.

The average amount of manual labour used on 30 farms of 100 ha. of arable land, is as follons:

15.5	Day-labourers
10.7	Permanent ditto
5.3	Permanent married labourers
31.5	**Persons**

For 6 farms in the neighbourhood of Magdeburg, and for piece work comprising the greater part of the cultivation of chicory, with workmen not belonging to the farm, this figure is reduced to 27 persons.

On an average one labourer is employed to every hectare of beets. The widespread custom of piece-work and the rational use of modern machines now employed in agriculture explain the lessening need for manual labour as compared with former years.

Machines used.

Mowing-machines are employed on a large scale, and the use of binders is becoming more and more general. Machines for uprooting beets are also largely used, though only in cases of necessity, as the work they accomplish is more costly. The work done by such machines drawn by animals costs 16 marks per ha. (6*s.* 3*d.* per ac.) while the same work is performed by labourers on piece-work at the rate of 6 marks per ha. (2*s.* 6*d.* per ac.). The same machine worked by steam traction costs 11 marks per ha. (4*s.* 4*d.* per ac.) more than if drawn by animals. In 6 farms having at their disposal a high tension electric current, this force is utilised for threshing at the price of 11 marks (11*s.*) per hour's work, of 0.44 marks per quintal (4*s.* 5*d.* per ton.) of corn and of 0.55 marks per quintal (5*s.* 6*d.* per ton) of threshed beet seed. On comparing machines for pressing straw with those for packing it, the latter gave the more satisfactory results.

Capital in Land and Buildings etc.

As regards land values there was only one case in which it was possible to fix a price reliable from every point of view; this was in a farm of 840 ha (2 075 ac.). The average value of the arable area is 2 950 marks per ha. (£58.7*s.* 6*d.* per ac), and that of the meadow land 2 570 marks per ha. (£50.17*s.* per ac.). The rent of this farm has so far been 93.2 marks per ha. (37*s.* per ac.) *i. e.* 2.82 % of the cost price.

The average value of the land of 18 farms may be valued at 777.4 marks per ha. (£15 11*s.* 6*d.* per ac.).

Total Working capital.

The total working capital is very large. By including every part of this capital, live and dead stock, as well as the varions expenses for growing the crops, it amounts on an average to 760 marks per ha. (£14.15*s*. per ac.) for all the farms of this district; this figure has only been taken from a few farms that had taken all advances into consideration at the beginning of the lease. But on the other hand, exact facts and figures can be produced as to the live stock employed: the average value of which is 188 marks per ha. (£3 14*s*. per ac.).

In the matter of dead-stock there is greater variation; nevertheless 68.80 marks per ha. (27*s*. 3*d*. per ac.) may be taken as a sufficiently exact average. The capital in circulation through 5 large farms, is 250 marks per ha. (£4.19*s*. per ac.), with slight variations. But, if the tenant is obliged on taking the farm to refund all the advances made by his predecessor, then this figure increases to about 254 marks (£5.2*s* per ac.).

Economical data.

The gross average revenue of the small farms of from 50 to 100 ha. is 822.4 marks per ha. (£16.5*s*. 4*d*. per ac.) that of the farms of from 100 to 350 ha. is 559.4 marks per ha. (£11 1*s*. 4*d*. per ac.), and that of the large farms is 562.6 marks per ha. (£11.2*s*. 7*d*. per ac.). Excluding two farms with very few cattle the gross revenue is divided as follows:

Class I:	products of the soil 52.3 %,	of live stock	46.3 %
Class II:	» » » 60.5 %,	»	37.3 %
Class III:	» » » 64.6 %,	»	28.0 %

The production of cereals and hoed crops appeared in the following proportions.

Class I:	cereals 29.5 %	hoed crops	29.5 %
Class II:	» 33.6 %	» »	27.2 %
Class III:	» 33.6 %	» »	31.1 %

The expenses incurred for each hectare of cultivated area are averaged in the three classes:

	Class I		Class II		Class III	
	Marks	%	Marks	%	Marks	%
Seeds and chemical manure .	71.86	11.4	49.16	10.9	49.62	10.9
Feeding stuffs	81.29	12.8	53.18	16.7	52.41	11.2
Live stock	191.72	26.4	99.31	11.2	110.18	23.6
Wages	145.86	24.1	159.67	36.4	149.86	32.1
Land, implements, etc. . . .	50.22	8.1	34.60	7.4	33.45	7.3
Insurance	22.49	3.5	3.38	1.7	16.31	3.6
Secondary industries	—	—	10.79	1.4	14.87	2.7
Sundries	61.11	10,7	46.91	9.3	38.13	8,4
	624.55		457		464.84	

In spite of the more intensive culture of hoed crops and the increase of live stock, the first Class has less expense for labour because the farm is managed and superintended by the owner himself.

The advantage, economically, of small farms of less than 100 ha., from the point of view of the beet industry, has been proved, in Magdeburg, by the high sale prices obtained.

Net Revenue.

The average net revenue per ha. of all the farms has been 169 4 marks (per acre, £3.9s). Farms of smaller area have given the highest net revenue per ha., and nearly those of State securities, in spite of the high value of the soil. Larger farms do not give such results, unless their value per acre is taken at a much smaller figure.

During the last 10 to 20 years, in the case of letting farms, the demand must have been greater than the supply, as the profit derived from them has oftener than not been very insufficient.

Out of the 15 large farms investigated, three brought in no industrial profits; in 5 cases, in spite of excellent products, the interest of the industrial capital was below 6 %; in only 3 instances did their revenues correspond with the principles laid down by von der Goltz, who is of opinion that, if, under existing conditions, the land capital has a right to 3 ½ %, 5 ½ or 6 % returns are due to the working capital, and from 7 ½ to 8 ½ % to the circulating capital.

194 THEODOR BRINKMANN. **Some Considerations on the Chapter of "Capital and Cost of Rural Structures".** (Theoretisches zu dem Kapital Gebäudekapital und Gebäudekosten). — *Fühlings Landw. Zeitung*, 60 Jahrg., Heft 21, pp. 721-752. Stuttgart, 1 November 1911.

Germany

After a critical study of some classifications of farm capital (Kraft, Krämer), the Author sets out the reasons why capital invested in rural structures is not regarded as forming part of the land capital and why it comes under the agricultural or working capital This classification is based on the fundamental principle by virtue of which in agricultural production, two perfectly distinct elements are taken into consideration :

1. The natural agent, limited to the factor primitive land, with the natural fertility accumulated thereon, and to the climate ;

2. The capital invested in the agricultural industry, which in conjunction with the labour of man, undertakes the working of the natural agent.

The capital invested in agricultural structures is productive, like all other capital which serves for the carrying on of this industry, and at the same time, like the others, it is a burden upon production ; it is the active element, whilst the land is the passive element. Agricultural structures however, for a comparatively lengthy period, determine the course of the agricultural industry, owing to their relatively high immobility ; machinery and implements, cattle, etc. and still more circulating capital, are more readily adapted to new forms and requirements of production, owing to their shorter duration and their greater mobility. It will be understood, therefore, continues the Author, that endeavours have most frequently been made, to determine what are the factors affecting the value of rural structures, and also that it has been sought to establish the best ratio between the land capital of the estate and that of the structures, for given conditions of production.

Though the results obtained hitherto are not always in agreement, and are sometimes contradictory also where the question is to define precisely the influence of a given factor on the extent and value of the buildings, this is due to the difficulties inherent in the application of the inductive method, because this method hardly admits of eliminating the errors resulting from the very diverse sources from which it must take its data.

The Author is therefore of opinion that for some problems the deductive method is simpler and also safer, when the premises are generally accepted. In this way he considers how the ratio between the capital of rural structures and the value of the property is gradually modified under the influence of extraneous circumstances, that is, the general environment and economic surroundings in which the agricultural industry develops. The value of the estate, he says, depends on the revenue it yields ; this revenue is in turn formed by the total net profit after deducting the interest on the working capital, assessed at the rate commonly accepted in the locality where the undertaking is situate. The value of the estate therefore increases and diminishes with the increase and diminution of its revenue. If then, we were to transfer an undertaking from bad extraneous circumstances to good ones, while leaving the working capital intact, and the interst thereon unchanged, there would be an increase of the value of the property proportionate to the improvement of the conditions and depending on the increase of the returns from the estate. In reality, however, to the improvement in extraneous circumstances there corresponds an increased need for working capital, and consequently for structures and buildings. The problem therefore amounts to ascertaining whether the increase of capital, in rural structures, corresponds proportionately to the increase of the value of the property. Let us suppose that an undertaking under the worst extraneous circumstances of production only pays a 4 % interest on the capital invested inthe structures, at the rate of 100 francs per unit of area and on the other working capitals, this figure of 100 fr. per unit of area will form the most suitable measure of the buildings capital. There is no estate value corresponding to this capital, because the whole of the revenue goes to the working capital, and there is no estate revenue in reality.

In proportion as the extraneous circumstances of the undertaking improve, it would be possible, profitably, to increase the buildings capital, and the time will come when the latter may be usefully doubled and reach the figures of 200 francs per unit of area. Then out of the two units of 100 francs each, the first will yield an interest which, having become an estate return, will be manifested in an increased value of the estate, while the second, originating from the improvement of conditions and forming as it were an outside or boundary quota in the increase of the buildings capital, will continue to yield the interest accruing to it. With a value of buildings of 3 units of 100 francs per unit of area, the first two units will go to increase the estate revenue and the third will become the boundary quota, which is the only one not contributing to increase its value. And so forth. The following numerical table exhibiting this increase of value clearly shows that there is no parallelism :

Extraneous circumstances	Buildings capital	Net Revenue
A Unfavourable.	100 = 100	4 = 4
B »	100 + 100 = 200	5 + 4 = 9
C »	109 + 100 + 100 = 300	6 + 5 + 4 = 15
D »	100 + 100 + 100 + 100 = 400	7 + 6 + 5 + 4 = 22
E Favourable	100 + 100 + 100 + 100 + 100 = 500	8 + 7 + 6 + 5 + 4 = 30

Extraneous circumstances	Interest accruing to buildings capital	Estate revenue	Value of prosperty
A Unfavourable. . .	4	4 — 4 = 0	0
B »	8	9 — 8 — 1	25
C »	12	15 — 12 = 3	75
D »	16	22 — 16 = 6	150
E Favourable	20	30 — 20 = 10	250

The mathematical character of the series representing the increase of buildings capital and property value appears still more clearly from the following numerical presentation :

		A	B	C	D	E
Buildings value	Amount	100	200	300	400	500
	Difference		100	100	100	100
Value of property	Amount	0	25	75	150	250
	1st Series of differences. .		25	50	75	100
	2nd » » » .			25	25	25

While the increases of the buildings capital form an arithmetical series of the first degree (that is, a series the differential quantities of which are always equal), the property values on the other hand form an arithmetical series of the second degree (that is to say, a series in which only the second differential series consists of equal members). If we represent by N the number of units of value of the buildings (100 fr.), the customary rate of interest by Z and the value of the estate by B, and if we assume that the increase of interest for each degree of the series is 1 %, the value of B will be given by the following equation .

$$B = \left(\frac{N + Z - 1 + Z}{2} \cdot N\text{-}N \, . \, Z \right) \cdot \frac{100}{Z}$$

or more shortly

$$B = \left(\frac{N^2}{2} - \frac{N}{2} \right) \cdot \frac{100}{Z}$$

in which B becomes a function of the square of the variable quantity N, and consequently every charge in N will be more strongly reflected in B.

In a problem like the one just studied, the part played by the statistical method of enquiry must be limited to verification ; by this method we may examine to what extent, in a given, case the influence of this principle has been manifested. This question may be exceedingly important in many cases. If in rural economy we were to accept only those principles confirmed by statistics, the progress of the science would be needlessly retarded. Many principles are beyond possibility of checking in this way, because in reality they only become apparent as a force opposed to another force acting in the reverse direction, so that the satistical method could only record the result. Such is in reality the principal function of the statistical method : it can record effects, but can never establish principles.

The problem of the relation existing between the value of the property and that of the buildings is of great practical importance when, for purposes of mortgage, it is requisite to ascertain the security which the estate may represnt ; the generally adopted principle, according to which the real security value is represented by 60 % of the total value, certainly cannot answer the requirements of credit.

Passing on to the study of the economy of rural structures, the Author gives prominence to the progress recently achieved in buildings, both technically and in the utilisation of materials. The main endeavour, on all hands nowadays, is to reduce the costs of construction and of wear and tear by building light structures, the shorter duration of which does not matter. Excessive durability of a farm structure is very far from being an advantage in itself ; it is a disadvantage accepted in return for a reduction of the rates of depreciation. Of two buildings, each equally answering the requirements and with equal expenses for wear and tear, preference should be given, says the Author, to the one lasting the lesser time, because it gives the undertaking a greater mobility and enables it to adapt itself better to the requirements of production.

The Author then proceeds to examine the vexed problem of the redemption of the capital invested in rural structures and in other longlife installations. On this subject, he says, there are two opinions and two methods under discussion.

The first consists in fixing the annual proportion of redemption, by dividing the value of the new buildings by the number of years they last ; that is called the method of division. The second, known as the compound interest method, calculates the annuity, the final accumulation of which at the end of the period of redemption, produces the capital invested in the new structures.

In pratical accountancy, the method generally adopted is the former, which has many partisans in the literature of agricultural economy, such as Seelhorst, Clausen and Lauer. Rosmiarek considers the second method more exact, but he holds the view that the first is sufficient in practice. Malinkowski alone maintains the second method from the practical as well as the theoretical point of view. As the problem is an arithmetical one, says the Author, it does not admit of two solutions, and the only rational method is that of the compound interest, because that method alone attains the object proposed by redemption, that is to say, repayment of the expenses by annual payments forming a uniform charge on the gross production of the industry during the period of redemption.

For this reason the Author proposes to designate this method in its relation to ruaral economy by the term Expenses Subdivision

Account. And he explains by means of numerous examples and practical applications, the rational necessity and the importance of adopting this method in agricultural accounts.

G. J. WARREN, K. C. LIVERMORE and OTHERS. **An Agricultural Survey of Tompkins County, New York.** (*New York Cornell Station, Bulletin* 295, pp. 385-569). *E. S. R.*, Vol. XXV, Abstract Number No. 6, pp. 594. Washington, 1911. **196**

United States: New York

This bulletin is a summary of an exhaustive survey of the conditions that surround the business of farming and the people on farms in four townships (Ithaca, Dryden, Danby and Lansing) of Tompkins County N. Y. It gives detailed statistics and points out the merits and defects of the various systems of distribution of profits, capital and expenses on the farm, the economic significance of the size of farms, distance from market, value per acre, labour, forms of tenure, and their relation to crops grown and crops sold, soil, livestock, cattle and cattle products, systems of farming, age and the increased earning capacity of educated farmers, together with suggestions for meeting some of the most important needs.

The relation of the size of farms to profits, receipts, expenses and labour is illustrated by the following table :

Farms operated by owners.

Classifications · size in acres.	Average size: acres	Receipts · per acre	Labor. cost per acre (1)	Receipts minus labor: per acre	Other expenses and interest. per acre	Net profit · per acre (2)
		$	$	$	$	$
30 or less . . .	21	26,14	19,90	6,24	13,76	— 7,52
31 - 60 . . .	49	14,24	8,10	6,14	7,61	— 1,87
60 - 100	83	12,49	5,60	6,89	6,32	+ 0,57
101 - 150. . . .	124	11,56	4,54	7,02	6,13	+ 0,89
151 - 200. . . .	177	10,89	3,92	6,97	5,22	+ 1,75
Over 200. . . .	261	10,93	3,33	7,60	5,22	+ 2,38

(1) Total amount paid for labour, value of board of labourers, value of unpaid labour by members of the family, and the farmer's labour estimated at $ 326 a year.

(2) Profit after deducting expenses, interest on capital at 5 per cent, and all labour as defined above.

The decreased cost of labour per acre on the large farm is attributed to the increased use of farm machinery, the value of which increases rapidly with the size of the farm, it being held that farm machinery on small farms costs nearly twice as much per acre as that on the larger farms that have nearly 3 times as much machinery. The most profitable general farms in the country contain from 200 to 300 acres of tillable land.

The question as to whether a farmer should rent or own land, when he has only a limited amount of capital, is discussed and illustrated as follows :

Relative opportunities for men with small capital as tenants and as owners.

CAPITAL	TENANTS				OWNERS			
	Number of farmers	Labor incomes			Number of Owners	Labor incomes		
		$ 601 to 1000	$ 1001 to 1500	Over 1500		$ 601 to 1000	$ 1001 to 1500	Over $ 1500
$ 1000 or less . . .	57	5	1	0	1	0	0	0
$ 1001 to 2000 . . .	58	8	0	0	35	0	0	0
$ 2001 to 3000 . . .	16	2	2	2	36	4	0	0
$ 3001 to 4000 . . .	1	0	0	0	114	11	0	0
$ 4001 to 5000 . . .	—	—	—	—	92	11	2	1
$ 5001 to 6000 . . .	1	0	0	0	91	18	8	3
Over 6000	1	0	0	1	196	46	22	21

On a comparison of the three forms of tenure, cash rent, share of crops and share of receipts, the tenant who paid cash rent made an average labour income of $ 604, and those who gave one-half of the receipts $ 342. The landlords who rented for cash made 5.2 per cent interest, while those who operated their own farms made an average labor income of $ 423 as compared with $ 379 for the tenant farmers. It is suggested that the three most important points for the improvement of agriculture in Tompkins County are larger farms, better cows, and a system of farming that combines stock with cash crops.

W. J. Fraser and R. C. Brand. **Four Systems of Dairy Farming and Profit on Each** (*University of Illinois: Dairy Department Circular No.* 151), Abs. *Farmer's Voice.* Bloomington, Ill., October 1, 1911. **196**

United States: Illinois

The amount of milk and butter fat produced per acre is the final test of profitable dairying where all feed is raised on the farm. The final resultant depends not only on efficient cows, but also on raising crops that contain a maximum amount of digestible nutrients and especially protein, which is so essential for dairy cows. Practical investigatious of the dairy farms of Illinois have been made in studying this subject, and clear reasons found for the poor results so frequently obtained. In other articles the writers have dealt with the poor cow and the necessary testing and year's milk record to find her out.

In this publication four different systems of cropping are compared, using in each case 160 acres of good land and producing all the feed on the farm.

The crops and rotations in these four systems of dairy farming are

1) Corn, oats, corn, oats, timothy, pasture, pasture, pasture
2) Corn, corn, corn, oats, clover, clover and timothy, pasture.
3) Corn, corn, corn, oats, clover, alfalfa, pasture, pasture, pasture.
4) Corn, corn, corn, corn, corn, alfalfa, alfalfa, alfalfa.

The following table gives a summary of the four Systems

Summary of the four Systems.

System	No 1	No 2	No. 3	No 4
Acres corn	38	57	57	95
Acres rye in corn	—	—	(19)	(57)
Acres oats	38	19	19	
Acres timothy	19			
Acres clover		19	19	
Acres clover and timothy		19		
Acres pasture	57	38	38	
Acres alfalfa			19	57
Acres roads and yards	8	8	8	8
TOTAL ACRES	160	160	160	160

Pounds of digestible protein available	26 804	35 024	48 850	80 237
Total digestible nutrients available	245 182	322 359	379 126	617 730
Number men required	3	4	4.5	6.5
Number horses required	4	5	5	6
Acres to support horses	15.9	17.9	13.3	12
Acres required per cow	3.6	2.6	2.1	1.4
Herd in cow equivalent	38	51	65	100
Bulls	1	1	2	2
Average number heifers raised.	5.3	7.1	9	14
Number old cows sold yearly	5 3	7.1	9	14
Number calves sold yearly	23.2	31 5	39.6	61.6
Average number cows kept	31.7	42.9	54	84
Average production per cow	5 000	5 500	6 000	6 000
Total pounds milk produced.	158 500	235 950	324 000	504 000
POUNDS MILK PER ACRE	991	1 475	2 025	3 150
VALUE MILK PER ACRE AT $ 1 533 PER 100 LBS.	$ 15 20	$ 22.62	$ 31.05	$ 48.30
Total value milk produced	$ 2 430.33	$ 3 617.90	$ 4 968.00	$ 7 728.00
Value cows and calves sold	202.10	272.00	343.80	534.80
Total valu^ of products	$ 2 632.43	$ 3 889 90	$ 5 311,80	$ 8 262.80

Cost of labor at $ 450 per man per year	$ 1350	$ 1800	$ 2025	$ 2925
Interest on land at $ 150 per acre, 5 % (1).	1200	1225	1250	1310
Taxes	80	85	90	100
Labor, interest and taxes	$ 2630	$ 3110	$ 3365	$ 4335
AMOUNT LEFT FOR PROFIT	$ 2.43	$ 780	$ 1947	$ 3928

Cost per acre to replace by rock phosphate, phosphorus removed	3.8c	5c	6.5 c	10 c
Total pounds nitrogen produced by legumes		2610	5420	10830
Total pounds nitrogen removed in milk and lost in handling manure	1900	2500	3140	5000
Total pounds nitrogen gained or lost	—1900	+ 100	+ 2280	+ 5830

(1) The interest is computed on $ 150 land for system No. 1 and to make allowance for building for the larger herds from $ 500 to $ 2200 are added to the investment for each of the other systems. The taxes are increased in proportion to the size of the buildings and herd.

Comparing actual results obtained from four dairy farms in the intensive dairy region of Northern Illinois with each of these systems, we find the following results.

Percentage of Land in Different Crops and Returns per Acre.

Crop	System 1	Farm 1	Syst. 2	Farm 2	Syst. 3	Farm 3	Syst. 4	Farm 4
Acres of Corn	25	25	37.5	23.5	37.5	35	62.5	56.5
» Oats	25	21.5	12.5	10	12.5	14		
» Timothy	12.5	16						
» Clover			12.5	19.5	12.5	14		
» Clover and timothy			12.5	19.5				
» Pasture	37.5	37.5	25	27.5	25	37		
» Alfalfa					12.5		37.5	43.5
Pounds of milk per acre	991	994	1475	1341	2025	2145	3150	4185
Amount of feed purchased		$ 400		$ 500		$ 1100		

These farms compare so closely to the systems in percentage of acres devoted to the various crops and the returns received per acre that they may well be taken as examples of the systems in actual practice in Illinois.

Full details of the feeding and figuring are explained in the circular, and they show the careful thought and practical judgment used in preparing this contrast of systems. The figures given show that an intensive system of dairy farming will rapidly increase the profits and the producing power of the farm, even though all the milk is sold, if the system includes the liberal growing of legumes. The careful saving and applying of all manure, and the addition of a few cents' worth of mineral constituents per acre annually, thus makes not only a permanent agriculture but an accumulative agriculture which at the same time is highly remunerative.

GRAVIER. **The Agrarian Question in Bosnia-Herzegovina.** (La question agraire en Bosnie-Herzégovine). — *Questions Diplomatiques et Coloniales,* No. 355, pp. 668-683. Paris, 1er Décembre 1911. **197**

Bosnia-Herzegovina

The settlement of the agrarian question is the most urgent necessity of the moment in Bosnia-Herzegovina, because with it is bound up the economic future of the country, as more than one half of the agricultural population still tills a soil which it does not own.

The "kmétes" (unemancipated peasants) want to have their and free and to have it for themselves.

The greater part of the soil tilled is still subject to a sort of feudal system : the tenants or kmétes settled thereon pay their " aga ", or Mussulman landlord, a part of the revenue derived from working the soil, called " khak " for cultivated lands, and " traonina " for pasture lands. This system exists side by side with free ownership.

The kmête still continues to pay the khak to his aga, and this sort of ground rent is charged according to the assessment of the tithe made by the commissions. In most cases this due is known under the name of " trietine ", which indicates that it is equivalent to one third of the revenue of the land. This is generally the case in regard to the kmêtes, who themselves furnish their tools, seed and working animals. The aga receives one third of the grain and fruits harvested, after the seeds and the tithe have been previously deducted. For grass lands it is usual to give the aga one half of the first mowing of grass. Therefore instances are not rare of kmêtes who, after paying the tithe and the khak, are short of grain for themselves, and must sell their cattle or go as day labourers.

While the burdens of the kmête grow heavier, the land at his disposal is reduced more and more, and, in the same proportion, the resources he derives from it.

The growth of the population has been attended by a fresh need for arable land. If it be considered that the soil requires frequent prolonged rests, in view of its character, and also the method on which it is worked, it will be readily understood that this position is a very critical one. Nevertheless the kmête has witnessed not only the reduction of the area of the land he cultivates, but also a falling off of its value.

In Bosnia-Herzegovina the cultivated lands in 1904 were only 22 % of the total area. The raising of livestock, which is still in the pastoral stage, the poor method of cultivation, which is still ignorant of intensive processes, find their explanation in the very character of the soil, in which over widespread areas calcareous rock appears everywhere, and only hollows and depressions shelter a little arable land, subject to floods and prolonged droughts ; valleys are rare and the water supply inconstant.

The kmête wants at least to free the land on which he lives, to redeem the dues he has to pay to his aga, and thus cease to be a kmête and become a full landowner.

The Government had to choose between two methods of redemption, optional and obligatory. It has decided in favour of the former. It has brought forward a bill for loans intended for the optional redemption of real property encumbered with the kmête servitude. According to this bill there cannot be redemption until there is mutual consent of the aga and the kméte. The loan can never exceed the objective value of the ground as assessed by the Government.

J. G. Mc Millan. **The Financial Aspect of Cheesemaking in New South Wales.** *The Agr. Gazette of N. S. W.*, Vol. XXII, Part 9, p. 771. Sydney, September 2, 1911. **198**

Australia: N. S. Wales

In the *Agr. Gazette of N. S. W.* for March 1911, under the heading " Cheese Shipped to London from Hawkesbury Agricultural College," the writer gave some estimates of the cost of manufacture of cheese, and the prices which could be paid to suppliers for milk when cheese is realising 56 *s.* per cwt. in London and Sydney respectively. As the figures have been questioned, Mr. Mc Millan gives the following details upon which they are based :

Statement of one week's transactions in the manufacture of cheese for export at a factory dealing with 1000 gallons of milk per day.

	£	*s.*	*d.*
Dr.			
To 7000 gallons milk at 4 $^{1}/_{4}$ *d.* per gallon . .	123	19	2
Rennet (4 oz. per 100 gallons milk) : 1 $^{3}/_{4}$ gall. at 13*s.*	1	2	9
Colour (2 oz. per 100 gallons milk) : $^{7}/_{8}$ gall. at 12*s.*	0	10	6
Bandaging (18 inches per cheese) : 44 yards at 3*d.*	0	11	0
Circles (2 per cheese) : 176 at 30*s.* per 1000 .	0	5	3
Salt : 170 lb. at 4*s.* 6*d.* per cwt.	0	7	0
Sundries (soap, brushes, acid, etc.) and repairs	1	0	0
Crates : 44 at 2*s.* each	4	8	0
Fuel (approximately) 7*s.* 6*d.* per day	2	12	0
Wages : Manager £ 3 ; assistant 42*s* ; youth 25*s.*	6	7	0
Cartage to railway	0	7	0
Freight to Sydney	1	7	9
Cartage to cool stores	0	6	0
Marine insurance at 11*s.* 3*d.* % on £ 173 5*s.*	0	19	9
Storage and delivery to steamer	1	1	5
Bills of lading	0	1	0

Freight prepaid to London on 6930 lb. at 5/8 *d.* per lb.	18	1	0
Landing, delivery, port dues etc.	2	0	10
Commission : 2 ¼ % on £ 173 5*s*.	3	18	0
Discount : 5 % at two months	1	8	10
Depreciation on buildings (Capital value £ 600) : 5 % per annum, one week	0	11	6
Depreciation on plant (value £ 400) at 10 %	0	16	0
Dividend : 5 per cent per annum on £ 1000	1	1	2
Balance	0	1	7
	£ 173	5	0

Cr.

By 6930 lb. of cheese at 56*s* per cwt.	£ 173	5	0

This may be summarized as follows :

	d.
Cost of milk per lb. cheese	4.292
Cost of materials, manufacture, sale, etc.	1.705
Balance 1*s*. 7*d*.	0.003
Per lb. selling price	6.000

Statement of one week's transactions in the manufacture of cheese for sale locally at a factory dealing with 1000 gallons of milk per day.

Dr.

To 7000 gallons of milk at 5*d*. per gallon	145	16	8
Rennet : 1 3/4 gallons at 13*s*. per gallon	1	2	9
Colour : 7-16th. gallon at 12*s*. per gallon	0	5	3
Bandaging	0	12	6
Circles	0	10	6
Salt : 170 lbs. at 4*s*. 6*d*. per cwt.	0	7	0
Sundries (brushes, soap, acid, repairs, etc.)	1	0	0
Fuel (including oil) approximately 11*s*. per day	3	17	0
Wages : Manager £ 3 ; assistant 42*s*., youth 25*s*.	6	7	0
Cartage to railway	0	6	6
Railway freight	1	4	7

Commission at 5 per cent	8 13 3
Insurance	0 7 6
Depreciation on buildings : 5 % on £ 600 .	0 11 6
Depreciation on plant : 10 % on £ 400 . . .	0 16 0
Dividend on capital : 5 % on £ 1200 one week	1 3 0
Balance	0 4 0
£	173 5 0

Cr.

By 6930 lb. of cheese at 56*s*. per cwt. . . . £	173 5 0

This may be summarized as follows :

Cost of milk per lb. cheese	5.051
Cost of materials, manufacture, sale, etc.	0.944
Balance 4*s*. or	0.005
Per lb. selling price . . .	6.000

The writer is confident that when cheese is exported and realises 56 *s*. per cwt., 4½ *d*. per gallon can be paid for milk, whereas when sold in Sydney at the same price, 5 *d*. per gallon can be given to suppliers. Fuel, rail, freight and cartage are varying items. If mechanical curd stirrers are used in the factory, less labour is required. Crates are not included in local sales, as they are not absolutely necessary, and if adopted at all, they can be used several times. Allowing for all varying local conditions Mr. Mc Millan is convinced that the cost of making and selling should not exceed 1 ³/₄ *d*. and 1 *d*. to 1 ¹/₈ *d*. per lb. for export and local sales respectively.

AGRICULTURAL INDUSTRIES

INDUSTRIES DEPENDING ON ANIMAL PRODUCTS.

199 **The Ultra Violet Rays in the Sterilisation of Drinking Water, and their Application to the Dairy Industry** (1). MAX RINGELMANN. Stérilisation de l'eau potable par les rayons ultra-violets. — *Journal d'Agriculture pratique*, 75e année, T. II, N. 46, pp. 619-621. Paris, 16 Novembre 1911. ANTOINE ROLET. Les Rayons Ultra-Violets en Laiterie. — *La Feuille d'Avis Agricole de France*, No. 4, p. 9. Marseille, Novembre 1911.

France

The vapour given off by mercury placed in a vessel where a vacuum has been formed becomes luminous when traversed by an electric current. This luminous vapour is exceedingly rich in ultra-violet rays: the latter are absorbed by glass, but pass through quartz or rock crystal.

The ultra-violet rays destroy animal and vegetable cells with great rapidity, and their energetic bactericidal action enables them to be used for the sterilisation of drinking water. The water on which the rays are directed is thoroughly sterilised in a few seconds as the rays destroy the ordinary microbes of water: typhoid bacillus, bacillus coli, cholera bacillus, and even the bacilli in spore form; no ozone or hydrogen peroxide is produced. The water obtained is freed from all toxins it might contain.

Ultra-violet rays are absorbed by a thin layer of air, so that it is necessary to submerge the appliance producing them completely in the water to be sterilised. The water treated must be clear; it must therefore be freed from the solid substances in suspension, as turbid water cannot be penetrated by the rays. Liquids, even when clear, which contain colloid substances (wines, beers, cider, milk, broth, etc.) are not very penetrable to ultra-violet rays, and their industrial sterilisation by means of these rays should not be expected.

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(1) See *Bull.* Feb. 1911, No. 408. (*Ed.*).

Interesting practical appliances have been designed, enabling those who have continuous current at their disposal to sterilise large quantities of water. The Author gives the principle and description of the plan of two of these appliances; that of Mr. Th. Nogier in which the quartz walls of the mercury lamp in which the ultra-violet rays are produced are in direct contact with the water which cools them: and that of Messrs Victor Henri Helbronner and Max de Recklinghausen (1) where the lamp, being placed in a rectangular box with three faces made of quartz slabs parallel to the luminous tubes, does not have its walls in contact with the liquid. The latter appliance is the more efficient, because, for the same intensity of current, the yield of ultra-violet rays falls off in proportion as the temperature of the lamp is lowered; if the walls of the latter are in direct contact with the water cooling them, the amperage of the current must be doubled to obtain the same luminous yield as in air.

There does not as yet exist any practical appliance allowing of industrial sterilisation of milk by the ultra-violet rays. Yet Dr. A. Billon-Daguerre obtains fairly good results by running the milk in a thin sheet between two plates of quartz allowing the passage of ultra-violet rays. By regulating the inclination of the plates, the speed of flow of the liquid is varied at will. Messers V. Henri and G. Strodel, pupils of M. Dastre, Professor of Physiology at the Sorbonne, state that the action of the ultra-violet rays on the milk is thoroughly effective. The sterilisation is complete, without noteworthy rise in temperature, abnormal taste, the loss of any of the properties of the food. As milk is opaque, however, it must, when submitted to chemical radiation, be made to flow in sheets not exceeding a few millimetres in thickness.

These are laboratory experiments. The results in industrial practice are still more important; trials are therefore being made in this direction by competent commissions.

If in pratice it is difficult to turn to account the bactericidal powers of ultra-violet rays for the direct sterilisation of milk, they may at least be made use of for sterilising the water used in butter treatment. The water may convey microbes into the butter, above microbes which will liquefy it (particularly the well known

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(1 See *Bull.* Nov. 1910, pp. 16-17; Dec. 1910, pp. 210-211. (*Ed.*).

Bacillus fluorescens liquefaciens) and curtail its keeping properties. Messers. P. Dornic and P. Daire, Director and Assistant in the Dairy Industry Station at Surgères (Charente-Inférieure) sterilised water intended for washing the recipients by ultraviolet rays. The sterilisation was incomplete, because the experimenters did not possess lamps which could be completely submerged in water. Furthermore, the water was not spread out in a sufficiently thin sheet. Notwithstanding this, the Authors (who continued their experiments under better conditions) were able to turn a highly contaminated water into a normal water, the bacterial contents of which enable it to rank with pure waters. Butter prepared with this water, after a month at the laboratory temperature (June), only had its surface slightly altered, which is inevitable. The same butter treated with unsterilised water only kept eight days.

It is not difficult to foresee the economic consequences which will flow from this recent application of electricity to the sterilisation of drinking water and the preservation and exportation of butter.

200 O. LAXA. **Disinfection of Dairies by Dry Methods.** — *Revue Générale du Lait*, Vol. IX, Liege, Belgique, 5 Novembre 1911.

Belgium

Eichengrün has invented an easy and efficacious method of disinfection by dry means, which he has named the « Autan » system. It consists in the use of paraformaldehide and of barium peroxide; it is, however. rather expensive and for this reason other less expensive methods have been worked out in imitation of the « Autan » system.

Evan and Russel have used formalin and potassium permanganate, while Huber and Riekel employ formalin, lime and boiling water. Dr Laxa has experimented with the three methods and has recently published an account of the results of his experiments of which the following is a short account:

A quantity of « Autan » sufficient for 60 cub. met. has been used on a space of 52 cub. met. in which sheets of paper containing *Bacterium coli*, *Thirotrix* and *Paraplectrum* were placed.

They were kept 18 hours under the influence of the « Autan » and were afterwards put into sterilized milk. The *Bacterium coli* did not produce any infection and the milk was still sterile after the lapse of one week, although it had been kept under a constant temperature of 37° C. (98 6 Fahr.). *Thirotrix* and *Paraplectrum*, placed under the same conditions, caused the milk to coagulate after three days, but the subsequent dissolution of the casein took place very slowly. From this it may be inferred that some organisms, though enfeebled, had withstood the action of the formaldehyde.

Other experiments with « Autan » have proved its efficacy against different bacteria placed not only on slips of paper but also in pools of milk 2 or 4 cm. (3/4 in. or 1 ½ in.) deep. Further, the moulds *Mucor* and *Cladosporium*, grown on bread, were destroyed, while *Penicillium* was only weakened.

Experiments were repeated in the same place and under the same conditions with the Huber and Rickel method. The disinfect- mixture consisted of 3.5 to 4 kg. (1) of formalin, 4 to 5 kg. of lime and 9 litres of boiling water, left to evaporate for eight hours. *Bacillus fluorescens liquefaciens*, *Bacterium coli* and *Bacillus bulgaricus* were completely destroyed on slips of paper. In one case, *Tyrothrix* lost its activity, while in another its activity was only diminished. *Mucor* on bread, was destroyed, while *Cladosporium* retained its activity.

Following the Evan and Russel method, a mixture of 1.2 kg. of formalin, 1.2 kg of permanganate and 1.2 kg of water was used on the same space of 52 cub. met. (2). After eight hours, the neutralisation of the formalin was brought abont by throwing half a litre of ammonia into the boiling mixture. Cultures of *Bacillus bulgaricus*, *Bacterium coli*, and the butyric bacteria, as well as *Tyrothrix* and *Paraplectrum* and different kinds of moulds, were destroyed when on slips of paper, but when on bread, only *Mucor* was destroyed.

After his experiments, Dr Laxa is of opinion that the method with permanganate is simpler than that with lime and easier to carry out than the « Autan » system. As the three methods do not differ much in their effects, the use of the permanganate method is advisable as being the most economical, but the « Autan » must be acknowledged to possess a slight superiority over the other methods.

Condensed Milks. — *Nature*, No. 2195, Vol. 88, p. 119. London, November 23, 1911. **201**

Great Britain

A Report by Dr. F. J. H. Coutts, on an inquiry as to condensed milks, has been issued by the Local Government Board. It contains much important matter on the history, methods of manufacture, composition, and use of condensed milk, with suggestions as to administrative control, labelling, etc. Condensed milk occurs as fullcream or machine-skimmed, and may be sweetened, partially sweetened, or unsweetened. The composition of the different brands varies somewhat; *e. g.* in the full cream and fully sweetened the fat varies from about 9.0 to 13.7 per cent., and the sucrose (generally beet sugar) from 37.2 to 41.5 per cent. The condensed milks, except occasionally in the unsweetened brands, which are sterilised, generally contain some micro-organisms (up to several thousand per cubic centimetre), but they show no disposition to multiply either in the unopened or in the opened tins, as a rule. Diluted condensed milk, however, becomes a favourable medium for the growth of bacteria. The process of condensation appears to be fatal to the tubercle bacillus. The importance of condensed milks is in connection with infant feeding. The skimmed condensed milks are to be absolutely condemmed for this purpose, owing to the small fat content. Infants fed on condensed milks seem to suffer from more infantile ailments, and the mortality is higher among them, than among those fed on cow's milk. As regards cost, the condensed milks are slightly more expensive than equivalent amounts of cow's milk and sugar. The labelling of some of the brands is very misleading to the poorer and illitterate mothers who principally use them. It is suggested that the skimmed brands should be labelled as unfit for infant feeding, and that some declaration of the content of fat and of substances foreign to milk should be obligatory on the labels.

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(1) 1 kg. = 2.2046 lbs. 1 litre = 1.76 pints.

(2) 1 cub. m. = 1.31 cub. yd.

202 G. GNADEBERG. **Preparation of Casein.** (Einiges über Casein). — Milchzeitung, No. 46, Leipzig, 18. November 1911.

Germany

In the manufacture of casein, inorganic acids, acetic acid, rennet or lactic acid are used. When inorganic acids are used, the value of the whey is very much reduced, and this is likewise the case with acetic acid, while rennet produces a casein of lower value. There remains lactic acid. The casein obtained by this latter method is good, and the whey may very well be used for feeding pigs.

To obtain casein by the lactic acid method, the milk, separated as perfectly as possible, is poured from the separator into a well tinned milk basin having a double bottom. The double bottom is necessary because it allows the temperature to be regulated by admitting steam between the two walls. To 100 gallons of milk 5 to 10 gallons of a pure culture of lactic acid prepared in skimmed milk are added and the milk is left in the covered basin at a temperature of 28° C. (82° F.). After 6 or 7 hours it begins to curdle, but is not yet gelatinous in consistency; it must then be stirred with a Dutch curd-breaker. Two or three minutes later it is heated to 52° - 56° C. (125-133° F.) Under normal conditions the casein will then take the form of lumps of the size of a nut floating in the whey; if the lumps are larger the stirring has been begun too soon; if they are smaller, too large a quantity of casein is being lost. The admission of steam is then stopped and the mass thus obtained is allowed to stand at the above temperature for 5 minutes; the whey is then rapidly run off, and water at 50° C. (122° F.) is poured into the basin until it covers the casein; it is carefully stirred for 15 minutes, and finally the water is thrown away. The basin is afterwards half-filled with cold water, stirred vigorously, and the water thrown way. The washing is repeated and the casein is pressed and drained. These operations are necessary because they reduce the ash-content of the casein. The liquid draining from the casein should be as nearly clear as possible.

After draining the casein a sort of chopping mill ("Quarkmühle") is used to cut it up finely, and it is spread out, in as thin a layer as possible, on wooden frames covered with linen, to dry. The drying must be carried out with the utmost care, and the temperature must not exceed 50 - 55° C. (122-131° F.). Therefore a drying chest must be used, in which the frames are put at 5 ½ to 6 in. above one another. For 265lb. of casein 100 frames 28 × 40 in. are sufficient. For the drying a cupboard with wooden walls, and fitted with doors which close tightly from the outside, may be used, being fitted up against the wall of the room. It is best heated by means of ribbed pipes, with steam, produced by an engine, circulating inside. The moist air will be expelled when required by means of a fan. The drying must occupy 8 to 10 hours. It may be accelerated by turning over the casein frequently by hand.

The casein lumps, when completely dry, should contain no soft portion inside, and be bright yellow in colour. Good quality casein should dissolve in alkalies, forming a thick, viscous mass of a non-milky character. The odour of putrefaction sometimes given off by casein when stored points to incomplete drying.

LEBONCQ. **The System of Butter Inspection in Holland.** — *Revue Générale Agronomique*, pp. 355-360. Bruxelles, Sept. 1911. **208**

Netherlands

Dutch producers who are concerned for their interests and the good repute of their dairy products, have, in addition to the State Agricultural Laboratories, established other special Laboratories known under the name of "Butter Control Stations". These stations are 8 in number, situate at Assen, Deventer, Eindhoven, The Hague, Groningen, Leeuwaarden, Maestricht and Middelburg. These Laboratories, created by private initiative, have for their object the supervision of the breeding of dairy cattle and the manufacture of butter in the regional dairies allocated to each Control Station. A laboratory for chemical analysis and bacteriological examinations, with a number of officers, is attached to each Control Station.

In 1903 the Government created the State Dairy Station at Leyden, with the object of ascertaining the chemical composition of samples of butter taken in accordance with the butter law, and making chemical investigations in the interests of the Dutch dairy industry. In 1904 the Government granted the Butter Control Stations official protection by means of a guarantee mark to be put on the products manufactured under their supervision. The State in granting its official seal to these institutions laid down stringent conditions for the managing staff and adhering members, but on the other hand undertook to afford financial support to these institutions.

The State Dairy Station at Leyden is entrusted with the task of issuing and supervising the official marks and keeping watch over the control stations. Furthermore it exercises over the control stations a direct supervision which consists in :

1. Inspection of the appliances and chemical products used in the laboratories of these stations.
2. Checking the use of the methodsprescribed for butter analysis.
3. Verifying the results obtained in analysing butter samples.

The number of dairies subject to control under State guarantee, on the 1st January 1910, was 877, with a yearly production of about 42 652 200 kilogrammes (1) of guaranteed butter.

204 M. Hitier. **The Milk Crisis in Large Cities.** (La crise du lait dans les grandes villes). — *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, 110e Année, No. 8, pp. 191-196. Paris, Août-Septembre-Octobre 1911.

France

Paris is at present suffering from a shortage of milk ; the large dairy companies find great difficulty in securing the quantity of milk required for the supply of the capital.

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(1) 1 kilog. = 2.2046 lbs.

It is chiefly the drought of 1911 which has given rise to this shortage, but there is also another reason, fraught with graver consequences for the future, which is, that a number of large farmers in the environs of Paris have changed their method of cattle-rearing, being unable to find cowmen. Thus the dairy companies are compelled to fetch their milk from within a larger and larger radius extending more than 150 kms. (nearly 100 miles) from Paris. Moreover, as the milk must be bought from small farmers who supply only the yield of a few cows, the cost of collection is notably increased.

We may add that at present the litre of milk fetches 13 centimes ($5\,{}^{3}/_{4}$ *d* per gallon) to the producer, and sells at 26 centimes ($11\,\frac{1}{2}$ *d* per gallon) to the Paris retail dairyman, who in turn retails it to his customers at 40 centimes (1*s* $5\,\frac{1}{2}$ *d* per gal.) in the shop, and 50 centimes (1*s* 10*d* per gal.) delivered to the door.

GEORGE M. WHITAKER. **The Milk Supply of Chicago and Washington**. — *U. S. Dpm. Agr. Bur. of Animal Industries Bull.* 138. pp. 34 + VIII plates + 6 figs. Washington, September 28, 1911. **205**

The bulletin under review includes two parts · the first part deals with the milk supply of Chicago and the second with that of Washington.

In parts I and II the following are discussed. — Amount of the supply; source of the supply; transportation and freight and freight rates; methods of handling the milk; organizations, wholesale and retail prices; the official inspection, and finally the production of high-grade milk. **United States**

Part I. — THE MILK SUPPLY OF CHICAGO.

Probably the daily consumption of milk in Chicago is about 1 000 000 quarts. The health commissioner estimated that 152 000 cows furnished the city's milk supply in 1908, which would make the average production 6.3 quarts per day per cow. His estimate for 1910 was 120 000 cows.

Most of the milk supply of Chicago is produced within 60 miles of the city, and a 100-mile circle about the city would include nearly all the dairies producing its supply, though in times of exceptional scarcity in the summer sweet cream is shipped 200 miles. The production of Chicago's milk within such a short distance of the city is in marked contrast with conditions in Boston and New York. Most of the milk supply of Greater Boston is produced outside a 50-mile circle, and some milk cars start 200 miles from the city. New York city receives practically no milk from within 50 miles, and some of its supply comes from points as far away as 400 miles. There is one reason for so large a production of milk comparatively near Chicago, namely, the fact that the city is not surrounded by a circle of suburban towns and cities, or by large areas of land used by city people for rural residences. As compared with New York, Philadelphia, and Boston, there is in the case of Chicago a somewhat abrupt transition from the thickly settled portion of the city to farming land.

The Chicago milk supply is chiefly produced in 24 counties. Fully 3/4 of the total supply is produced in Illinois.

The milk supply of Chicago comes in on about 18 different raibroads, but nearly 2/3 of it comes over two lines entering from the northwestern territory. The large dealers who ship bottled milk by the carload ice it in the summer, but the supply of can milk comes in ordinary baggage cars, largely on passenger trains. A city ordinance requires this milk to come into the city in sealed cans.

There is no uniformity in the system of freight rates for milk on the different railroads, and no regular zone system of charges as in New York and Boston. Stated in a general way, the matter resolves itself practically into 3 zones, in which the freight rate is 15, 16, and 16 ½ cents a can of 32 quarts for much of the milk shipped. As regards bottled milk, there is no official tariff per carload, but the rate is based on at least 300 crates to the car at 10 to 14 ½ cents a crate, or a minimum of 20 dollars per day per car. The dealers estimate the freight to cost them on an average 3/4 of a cent per quart The rates are the same for milk and cream.

Comparatively little milk is distributed in Chicago by the producers. Almost the entire product passes through the hands of middlemen, of which there are two distinct types, employing distinct methods: the large dealers and the smaller dealers.

The large dealers adopt the method of « country bottling ». They receive their supplies from the producers at country stations which the dealers own and operate. These stations are located near a railroad and connected with it by a spur track. In the morning the farmers deliver at the station the milk of that morning and the previous evening. It is as a rule cooled by the farmers to 60° F. or below, in tanks of ice or well water, mostly the latter.

Milk handled at these stations is bought by the hundredweight. No milk is bought on the basis of fat percentage, though there is a minimum requirement.

Occasionally the producers cooperate in the hauling; in such cases it is customary for each one of a small group to take turns in hauling his milk and that of his neighbours to the station.

As soon as the milk is weighed it goes to the milk rooms, where it is mixed, cooled, and bottled. Some of these «bottling plants» filter, clarify and pasteurize the milk as well. When bottled it is crated, and the crates are iced for transportation. Some plants have a condensing outfit and do a large condensed milk business, in addition to the market milk trade. Many plants have separators for obtaining cream for the cream trade, and most of them are equipped for manufacturing butter, in case of a surplus of milk, and also for making buttermilk. Some have a refrigerating outfit.

The milk cars containing this bottled milk reach the city about midnight with the milk of that morning and the previous evening. They are switched at once to sidetracks, controlled by the dealers, and unloaded directly on to their platforms.

The two largest dealers of Chicago have 23 establishments, and receive 900 to 1000 wagons each per day.

The number of the smaller dealers of Chicago is approximately from 1200 to 1500, and they receive the milk from 5000 to 5500 producers.

The small dealers obtain their milk supply in the city at the railroad platforms, of which there are from 60 to 70, and haul it to their places of business. These dealers buy of the producers, who deliver the milk at the local stations, where it is collected by the milk trains. This milk is handled in 8-gallon cans. The small dealers buy by the can.

Most of the milk handled by the small dealers is retailed in bottles; a 50-can dealer is considered as one doing a relatively large business.

Boston has a bacteriological limit of 500 000 per cubic centimeter, and the relative percentages of the samples of milk that exceeded this number were found upon investigation by the local board of health to originate as follows: — Place of production, 1.5; cars on arrival at the city, 12.4; peddlars' wagons, 45.6; stores, 71.5. Similar conditions existed in Chicago until recently. It was also ascertained that, as a rule, these stores were located in those districts of the city which had the highest infant mortality. Hence the common practice of dipping milk from the can in serving customers has been prohibited, and nothing but bottled milk is now allowed to be sold from stores. This regulation has been very beneficial in reducing the number of samples below grade in regard to the milk solids, and has resulted in great improvement in the purity of the article.

The *Milk Shippers' Union* is an organisation of the producers who ship milk in car lots to small dealers. Different localities have local unions, who elect delegates to a central union. The union elects a board of directors, one from each line of railroad represented. The 10 or 12 larger dealers have an organization called the *Illinois Milk Dealers' Association*, the smaller dealers have an organisation called the *Chicago Milk Dealers' Association*, and the drivers of milk wagons have an organization called the *Milk Drivers' Union*.

The prices paid by the milk dealers have constantly risen from 1896 to the present time. During 1911 the price paid by the milk dealers per 8-gallons can delivered at Chicago varied from a minimum of 0.95 dollars in June to a maximum of 1.55 dollars in January, and the price paid for 100 lbs of milk delivered at bottling establishments in the country varied from a minimum of 1.10 dollars in May and June to a maximum of 2 dollars in January. The bottlers contract for milk for 6-months' periods in April and October; the shippers fix their prices in May and November.

The retail price of milk in Chicago is 7 cents a quart.

Milk inspection in Chicago is under the general supervision and direction of the health commissioner. The milk laws in force in the city are for the most part municipal ordinances

The sale of milk at a temperature over 70° F., or containing over 3 000 000 bacteria per cubic centimeter, is prohibited.

Part. II. — THE MILK SUPPLY OF WASHINGTON.

The District of Columbia consumes about 76 000 quarts of milk a day, or about 0.4 of a pint per capita. This is produced on 1091 dairy farms, from 17 688 cows. Most of the supply is produced within 55 miles of the city. The bulk of it comes from London and Fairfax Counties, Va. and Montgomery and Frederick Counties, Md. Most of the milk shipments are 40 quart cans, though some twenties and thirties are used. The freight rate on the steam roads is from 2 to 3 cents a gallon, and on the electric roads from ½ cent to 1 ½ cent a gallon according to distances. Freight is paid by tickets attached to the cans. The 1091 farmers who produce milk for the District of Columbia have herds averaging about 16 cows in each. Only 32 exceed 50 cows, and only 4 farmers have herds exceeding 100 cows each.

Sixty-two dairymen, keeping 734 cows, reside within the District limits, and retail their product without the intervention of middlemen. Of these there are in the district about 79 who have regular milk plants. Dealers do a business ranging from 50 to 2000 gals a day; 13 per cent (the larger dealers) doing one half of the business, and 87 per cent (the smaller dealers) doing the other half.

Milk on reaching the dealer's plants has in the great majority of cases been from 4 to 7 hours in transit, frequently without any refrigeration. It is usually cooled to some extent on the farm. It reaches the city plants between 10 and 12 o' clock a. m., and is cooled at once; then it is bottled and put in cold storage until time for the morning delivery. The tendency to pasteurization is on the increase.

The milk dealers of the District have an organization known as *the Dairymen's Association of the District of Columbia, Maryland and Virginia*. The producers also have an organization, called *Milk Producers' Association of Maryland, Virginia, and the District of Columbia.*

The price to the farmers is made for 6-months periods, November 1 and May 1. In 1909 the summer price was 14 to 16 cents a gallon, and the winter price (1909-1910) 22 cents a gallon. The retail price ranges from 8 to 10 cents a quart according to quality.

A milk law enacted by Congress for the District of Columbia became effective in March, 1895, and milk inspection in the district dates from that year. A general food law for the district of Columbia, passed a few years after the milk-inspection law, establishes a milk standard of 3 ½ per cent of fat, 9 per cent of solids not fat, and 12 ½ per cent of total solids. By an order issued November 5, 1910, relative to applications for new permits, if all cattle on the dairy farm to which any such application relates are not free from tuberculosis, as shown by the tuberculin test, the application will be rejected. A most remarkable fall in the death rate among infants from diarrhoetic diseases (from 220 per 100 000 in 1882 to 85 per 100 000 in 1910) began with the establishment of milk inspection in 1895.

806 **The Jerked Beef Industry of Uruguay** (1). — *Journal of the Royal Society of Arts*, No. 3076, Vol. LIX, p. 1124. London, November 3, 1911.

Uruguay

In Uruguay alone there are 23 establishments called « saladeros » where the preparation of jerked beef is carried on, while in the river region of Argentina and Brazil they number 22. The number of cattle killed at the saladeros of the River Plate region, consisting of Uruguay, Southern Brazil and Argentina, in 1908 was 740800; in 1909, 1 062 800; in 1910, 1 233 208; and in 1911 up to May, 1 024 400. In establishing the saladeros where the cattle are slaughtered, and the beef cured, a piece of land several acres in extent is selected, on which are erected the buildings needed for this industry. The principal structure is usually about 175 feet by 100 feet, and 40 feet high, with a brick foundation, the sides being of brick, pine, or galvanised iron, more or less open and covered with a corrugated iron roof. In an enclosure at one end the cattle are killed by driving a knife-blade into the spinal cord just behind the base of the skull. The animal is then carried into the building and dropped on the cement floor, where the hide is dexterously removed, and the carcase elevated by a travelling tackle running on a trolley cable. The usual method is followed of removing the waste and quartering, the bones being removed so skilfully that the flesh, after a few slashings, forms a large, flat, single piece, which is allowed to hang for a few hours for the animal heat to pass out. It is then thrown into a large vat in the floor containing a very strong brine, where it remains for several hours, to be afterwards piled between layers of salt. After a varying period of time the meat is removed to the open air, where it is again stacked and salted, the drying process continuing there for several months. Acres are covered with these piles of meat to a height of 10 feet, salt frequently being thrown over the surface.

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(1) In 1900 the land devoted to pastoral purposes covered about 37 000 000 acres, while the cultivated area was about 1 383 800 acres. In 1908 there were within the Republic 9 000 000 head of cattle, 1 000 000 horses, 26 000 000 sheep, 60 000 mules, 40 000 goats, and 120 000 pigs. In 1907 breeding stock was introduced from Europe and Argentina to the extent of 540 cattle, 2282 sheep, and 181 horses. The cattle industry is followed in all the departments, but most extensively in Salto, Paysandu and Rio Negro. From Fray Bentos in 1907 there were shipped about 15 000 tons of animal products valued at 2 156 000 dollars, about 112 500 head of cattle having been slaughtered in the year. (*Statesman's Yearbook for 1911*, p. 1316. London, 1911).

See also *Bull.* May 1911, No. 1348; June 1911, No. 2045; and Aug.-Sept.-Oct. 1911, No. 2410. (*Ed.*).

If rainy weather appears, the meat is covered with a strong tarpaulin, although windy, cloudy weather is preferred to sunshine. When ready for the market the desiccated beef, or « tassajo » is black in colour, a few feet square, and an inch or two in thickness, and as hard as sole leather. Very little « tassajo » is eaten in Uruguay, the greater portion being exported to Brazil, Cuba and Porto Rico, where it is eaten raw, or after boiling for some hours.

Near the principal building is a smaller one, used for curing and storing hides. The floor is of cement, into which are sunk several large tanks half-filled with brine, in which a certain quantity of corrosive sublimate has been dissolved After removal from the animals, the hides are thrown into the vats, remaining thirty hours, and are then spread out on the floor, one above another, and well salted. After curing for some days, the hides are baled ready for export. Another building in close proximity contains the boiling-room, where the fat is extracted from the bones, head and intestines, to be made into soap and candles.

INDUSTRIES DEPENDING ON PLANT PRODUCTS

The Sugar Industry in Italy. (Report of the Consul General at Genoa, Italy). (Die Zuckerindustrie in Italien). — *Das Handelsmuseum*, No. 44, pp. 671-673. Wien, 2 Nov. 1911. **207**

Italy

The sugar industry is one of those which have developed most in Italy during the last three years In 1910, the imports of foreign sugar did not exceed 65 000 quintals (1), while in 1898-18 99 they amounted to 735 374 quintals.

In 1888 the sugar beet was hardly cultivated in Italy, while in 1910 there were 29 sugar mills, 6 sugar mills with refineries, and 3 refineries. The majority of the sugar works are established in the Po valley, where are likewise situate the largest beet-growing areas.

(1) 10 Quintals = 0.984 ton.

North of the Po there are sugar works at Ostiglia, Ficarolo-Po, Legnago, Lendinara, Cologna-Veneta, San Bonifacio, Vicenza, Cavanella-Po and San Vito al Tagliamento. Between the Po and the Apennines there are sugar factories at Savigliano, Spinetta, Marengo, Sarmato, Piacenza, Parma, Bazzano, Ferrara, Pontelagoscuro, Codigoro, Miola, Massalombarda, Forlì, Cesena, Mezzano and Classe.

There are likewise sugar works at Granajolo and Montepulciano in Tuscany, at Foligno and Rieti in Umbria, and at Naples.

The sugar works with refineries are at Pontelongo, Pontelagoscuro, Ferrara, Bologna, Senigallia and Avezzano, and the refineries at Ferrara, Sampierdarena and Ancona.

The Italian sugar factories and refineries belong to joint stock companies which have formed a federation under the name of « Unione Zuccheri » (" The Sugar Union "). The centre of the industry is Ferrara and of the trade, Genoa.

The most important companies are the following :

Liguria - Lombardy Company
» - Vicentina »
» - Sanvitese »
» - Ravennate »
Zuccheri Romani Company
Lendinarese Maraini & Co.
Evidania Company
Gulinetti »
Valsacco » of Naples
Lebaudy » of Ancona.

Only in 1910 did the sugar industry begin to find capital among real farmers, who founded a sugar factory at Ceuto and one at Rovigo.

The Italian sugar industry may find a large market abroad, if the export bounties are suitably distributed.

208 DINTER. (Austro-Hungarian Consul at Kiew). **The Sugar Industry in Russia.** (Europa-Russland - Kiew). *Berichte der K. u. K. Oesterr.- Ung. Konsularämter.* Jahrgang 1911, S. 5-9. Wien, 1911.

The result of the 1910 sugar season in Russia was satisfactory.

Russia

The country produced 61 476 773 poods of sugar (1 pood = 0.016 ton), and exported 5 397 872, of which 3 682 177 went to Persia, China and Afghanistan, whilst 404 231 alone were exported to States adhering to the Brussels Convention.

The home consumption rose from 60 830 809 poods in 1909, to 68 853 144 in 1910, owing to the increase in purchasing power of the population.

In 1911, the area growing sugar beet amounted to 598 405 dessiatines (1 dessiatine = 2 69 acres), which gave the enormous increase of nearly 100 000 dessiatines as against the previous year.

The production was 801 782 900 poods of beet, being 1340 pood per dessiatine (nearly 8 tons per acre) of beet, and 195 (23 cwt per ac.) of sugar A syndicate formed among Refineries reduced the production for the market to 50 000 000 poods and the reserve production to 2 000 000 poods in order to raise prices The best customers, among States adhering to the Brussels Convention, are Egypt and Turkey.

Sugar Production in Java. — *The Louisiana Planter and Sugar Manufacturer*, No 20, pp. 322-323 New Orleans, Nov. 11, 1911. 209

Dutch E. Indies: Java. Cuba

A few years back the Island of Java became the leading sugar producer of the world At that time the statisticians had not yet included the great two to three million ton crop of India in their reports, as these East Indian sugars rarely reached the world's market, being all consumed at home; further, India was a very considerable importer of sugar from other countries.

So far as Java is concerned, however, it has lost its precedence in the sugar world, now, because of the rapid advance made in Cuba; but it is rather interesting to note that the level of about 1 200 000 long tons of production that was reached in Java some years ago was surpassed in 1910, when the production was 1 280 000 long tons.

In 1911, with an increase of about 13 000 acres of land, the production of raw sugar reached 1 455 000 long tons. The plantings of 1911 that will produce the crop of 1912, indicate a further increase in the area planted of about 10 000 acres in cane, and as the Dutch in Java are such careful cultivators, and as they are so successful in sugar cane production and in sugar manufacture, it now looks very probable that the year 1912 will bring the production of Java up to a million and half long tons of sugar, and that Cuba, although exceeding 1 800 000 tons in the year 1909-10, will for 1912 at least, again fall behind Java, as the crop prospects in Cuba both for this year, and next year are not very satisfactory.

210 The Manufacture of Beet Sugar in the United States. (Rübenzucker-Fabrikation in Amerika). *Centralblatt für die Zuckerindustrie,* Nr. 9, pp. 285-287. Magdeburg, 25. November 1911.

United States

The area under sugar beet in the United States was 535 000 acres in 1911 as against 429 000 acres in 1910.

The production is improving and increases noticeably simultaneously with the area of cultivation, thanks to improved systems of culture introduced and the continued growth of the use of chemical fertilisers.

In 1911, 6 new sugar factories were built, 2 in California, 1 in Colorado, 1 in Nevada, 1 in Ohio and 1 in Utah. They have a total daily output of 3500 tons.

The beet sugar output of the United States, together with that of cane sugar in Louisiana, Texas and the colonies of Hawaii, Porto Rico and the Philippines — which is estimated at 1 280 000 tons — amounts to 1 880 000 tons, being only one half of the total sugar consumption in the United States.

The spread of cane culture as well as that of the sugar beet in the United States is an outcome of the protective duties now in force in the North American Republic.

A reduction of the customs tariff would on the other hand be of advantage to the refineries, which at present produce not more than 70 % of what they could supply.

In order to improve and stimulate the growing of the sugar beet, a prize of 5580 francs has been offered for the best beet produced. The value of the products will be assessed in points, and the prize given to the farmer presenting an article the sugar grade of which reaches 45 points, the purity 15 points, the size 15 points and the weight 25 points. Each specimen of growing must consist of 5 beets.

211 The Wine Trade in Egypt. (Le Commerce des vins en Egypte). — *Bulletin de l'Office du Gouvernement Général de l'Algérie,* No. 23, p. 360. Paris, 1er Déc. 1911.

Egypt. Europe

The Egyptian consumption of foreign wines in 1910 reached a value of 4 116 260 francs, divided as follows :

	1 168 360	from	France
	924 690	»	Italy
	711 880	»	Turkey
	472 340	»	British possessions
and	838 990	»	other countries.

France forwards to Egypt, Bordeaux, Burgundy and Champagne; Italy sends Asti and Chianti; Greece sends Samos; Germany the Rhine wines; and England Cyprus wines.

The demand for Italian wines by importers supplying the public at large is in process of constant growth.

Algerian wines, good in quality and generally cheap, would probably find a ready market in Egypt.

What are required in Egypt are the natural wines within the reach of moderate purses.

A. Howard and G. L. C. Howard. **The Milling and Baking Qualities of Indian Wheats**. (Some New Pusa Hybrids Tested in 1910). — *Agricultural Research Institute, Pusa, Bulletin* N° 22. Calcutta, 1911. **212**

British India

Gathering together the various conclusions scattered through this paper and summing up the progress that has been made up to the present time at the Agricultural Research Institute of Pusa the following statement can be made: that the idea hitherto held that India can only produce weak wheats is erroneous. Strong free-milling wheats have been produced at Pusa during the last three years, and have been tested in England by a well-known anthority on questions connected with the milling and baking qualities of wheat, whose reports deservedly carry great weight. The combination of high grain quality and high yield in the same wheat has been brought about at Pusa by modern plant breeding methods, and the work confirms that previously carried out at Cambridge on similar lines. High yielding wheats obtained both by selection and by crossing are now available at Pusa for distribution to the cultivators in those tracts which suit these particular wheats. They are all of the type most in favour for consumption in India and also for use by the home millers.

The producing power of the soil at Pusa has been more than doubled by hot-weather cultivation, by moisture conservation and by embanking, with occasional green manuring.

Yields of over 40 bushels of wheat to the acre have been produced without manure, irrigation, or rain after sowing time. The methods adopted at Pusa can he applied with necessary modifications throughout the Indo-Gangetic plain. There is no doubt that a great increase in the yield of the present area of the alluvium under wheat and other crops is possible even with no further means than those now possessed by the people.

To bring this to the notice of cultivators there is one method beside which all others sink into insignificance and that method can be summed up in one word: Example.

213 HEARD. **Production of Attar of Roses in Bulgaria.** — *The Board of Trade Journal*, No. 780, p. 301. London, Nov. 9, 1911.

Bulgaria

The yield of attar of roses for the district known as the Valley of the Roses, where some 7 000 acres are under cultivation, amounted in 1910 to 5 550 lbs. valued at £ 148 000, as against 11 000 lbs. in 1909. The 1911 crop has suffered from frost. A rise may consequently be expected in the price of the essence.

Owing to the deficiency in the last crops, and to the great demand, adulteration has reached such a pitch that the local authorities, who declare themselves unable to stem the sumuggling into the district of the oil of geranium, propose to withdraw the prohibition against its introduction, so that the mixture may become a recognised article of trade and buyers take their precautions accordingly.

214 **Capé Leaves from the Ivory Coast.** (Essence de Capé). — *Bull. Scient. Indust. Roure Bertrand Fils*, 3e Série, No. 4, p. 40. Grasse, Octobre 1911.

French West Africa

A small quantity of leaves called " Capé ", the botanic origin of which is not yet fixed, has been received by the Firm of Roure Bertrand Fils of Grasse, from the Lieutenant Governor of the Ivory Coast. On distillation, 9 kilograms of these leaves produced 25.8 grs. of a greenish-yellow mobile essence, which at first smells like patchouli and on evaporation emits a very agreeable odour of extraordinary strength.

These leaves are used as a perfume by the natives.

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ANTONIN ROLET. **The Picholine Olive Industry.** (L'industrie des olives à la Picholine) — *Journal d'Agriculture pratique*, 75e Année, Nouvelle Série, T. 22, No. 45, pp. 592-594. Paris, 9 Novembre 1911.

France

The industry of olive preserving and preparing for market is of some importance in the south-east of France: Marseilles, Saint-Chamas, Salon, the valley of the Baux, in Bouches-du-Rhone; Nîmes in Gard; Saint-Jean-de-Fos, Gignac in Hérault; Belgentier, La Roquebrussane, Méounes and Signes, Salernes, Aups and Cotignac in Var; and Nyons in Drôme (black olives) are the principal centres. The production of the South is estimated at 5 to 6 million kilogrammes. Hérault and Gard supply 3 to 3 ½ millions (5 to 6 thousand tons); Bouches-du-Rhone, 300 000 to 400 000; Var 600 000 to 800 000 kg.

Spain is a great olive producer, and the very large Seville variety is in great demand. Spain exports 4 160 000 francs worth of preserved olives, mostly green.

In spite of the large French production, France imports more than one million kilogrammes of olives from Spain, Algeria, Greece, Turkey and Asia.

The most usual method in the industrial production of green olives is the use of an alkaline liquor, a method known as the Picholine method from the name of the inventors, two Italians who settled at Saint Chaumas 200 years ago and introduced the recipes long used in Italy.

The degree of concentration of the brine depends on the variety of fruit, the size, the consistency of the pulp, &c. To-day soap-makers' lye is used at 6° Baumé for the varieties " Verdale " and " Amelan " at 5° for the " Picholine " and 3° for the " Lucques ".

For the market, the finest varieties in point of size (though with small stone) are selected, with good green colour and fine and aromatic pulp. For some of these features the varieties " Picholine " or " Coiasse ", " Saurine " or Martigues olive, " Verdale ", " Longue de Belgentier ", " Lucques ", " Amelau ", " Salonenque " are appreciated.

The standard barrel used is a 40 kg. one, but they are made of all sizes from 1 to 160 kg. Ordinarily the largest contain the biggest fruits and vice versa. The wholesale selling prices vary, but fluctuate about a mean of 50 francs per 100 kg. (£1 5s per cwt.).

216 **Italian Tomato Products** (1). — *Journal of the Royal Society of Arts.* No. 3076, Vol. LIX, p. 1123. London, Nov. 3, 1911.

Italy

The province of Naples has for years been noted for the production of a species of tomato specially suited for the manufacture of tomato sauce, extract and paste. The fruit is small, thin skinned, free of fibre, and has small seed, and a special flavour.

In the manufacture of tomato sauce and paste the fruit used is fully ripe, the unripe fruit being set aside in baskets to ripen before being used. Speckled or mouldy fruit is placed in a special oven, dried, and afterwards made into a thick tomato paste, of low grade which is not exported. It is the custom to prepare the fruit within a day after it is gathered. It is first carefully sorted, and then washed in hot water. Afterwards it is sorted again and washed in cold water, then automatically carried to the tables to be peeled. The residual parts of the fruits, such as the skin are automatically dried, in some cases to obtain cellulose. Oil is extracted from the seeds. Often the peels are sold for food for cattle or for fertilisers. In the process of manufacture the fruit is pulped by air blasts as needed, and is then run into automatic boxes with double bottoms, the lower compartment of which is filled with steam, which mantains the product at a temperature of about 176° F.

The concentration is effected previously by means of a vacuum. After being cooked it is canned immediately in tins which have first been submitted to sterilisation, by means of steam at 194° F. for 30 minutes. Then the tins are closed and sterilised again for another 20 minutes at a temperature of 230° F. Whether fermentation is desirable in the preparation of these products appears to be a matter of opinion among the manufacturers. In one method, fermentation is brought about by a slow process of heating; in another it is provoked by the use of selected germs. After the fermentation is produced, it is checked by the addition of salt in small quantities. Each time the work is suspended all vessels that have come into contact with the fruit at any stage of the manufacture are washed with a solution of bisulphide of soda, with boiling water, and finally with cold water.

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(1) See *Bull.* Jan. 1911, No. 149. For the cultivation, see *Bull.* Nov.-Dec. 1911, No. 3151. (*Ed.*).

817 RAYMOND F. BACON and P. B. DUNBAR. **Changes Taking Place during the Spoilage of Tomatoes, With Methods for Detecting Spoilage in Tomato Products.** — *U. S. Dptm. of Agr. Bur. of Chemistry. Circ.* No. 78; pp. 15. Washington, October 16, 1911.

United States

Tomatoes contain on the average, about 6.4 per cent total solids, of which 3.5 per cent is invert sugar, 0.5 per cent citric acid, 0.6 per cent ash, 0.9 per cent protein (N × 6,25), 0.85 per cent crude fibre, and about 0.05 per cent fat. When tomatoes spoil as a result of the life processes of bacteria, yeasts, and moulds, the sugars are rapidly used up, being changed principally into acetic acid, lactic acid, alcohol, and carbon dioxide, the amounts of these substances depending on the types of organisms which are most active in the particular sample in question.

During most classes of spoilage the citric acid is also rapidly decomposed, so that its amount serves as a valuable index in detecting decomposition. As the writers' analyses have proved, it is very easy to detect spoilage in tomato pulp or canned tomatoes, as such products, when perfectly sound, contain no volatile acids and a considerable percentage of citric acid and invert sugar, and when spoiled quite large amounts of volatile acids are present with little or no invert sugar or citric acid. But in such complex products as tomato ketchups and the various tomato sances, of which sugar and acetic acid may be legitimate ingredients, the ordinary analytical determinations give very little information as to the soundness of the tomatoes from which these products have been prepared. The writers have found, however, that the condition of the tomatoes which enter into ketchups or other tomato products may be ascertained by determining the nature and quantity of the acids present and to a certain extent by the changes in the nitrogenous constituents.

Also certain analytical ratios seem to give some information on this point. A good ketchup or other tomato product is characterized by high citric acid content and no, or very little, lactic acid, and a product prepared from spoiled tomatoes will probably have a low citric acid content (often none) and a high content of lactic acid.

The following were shown by the writers' examination of tomato products: — the acid of tomatoes (which has been ealled by various authors malic, citric, tartaric, and oxalic) is actually citric acid; sound tomatoes contain no volatile acids; the sugar of tomatoes is usually invert sugar with at times a slight excess of levulose, both sugars being consumed during the fermentation of tomato pulp; in general, as tomatoes spoil, the ammonia obtained by distillation with magnesium oxide increases in amount, and the amount of ammonia so obtained is, for a pulp prepared from whole tomatoes, about twice as great (about 0.04 per cent) as from a skin and core pulp (about 0.02 per cent).

A table summarizes the results on some commercial products, for which only a few of the more significant determinations were made.

Methods are proposed for the determination of citric acid and of lactic acid in ketchups, and the behaviour of lactic, malicand tartaric acid towards oxidizing agents are determined.

PLANT DISEASES

19

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

The Importation of Young Vines into Bulgaria. (Importation des plants de Vigne, en Bulgarie). — *Feuille d'Informations du Ministère de l'Agriculture*, No. 42, p. 3, Paris, 25 Octobre 1911. 218

Bulgaria

The Ministry of Commerce and Agriculture has laid down the following conditions with regard to the importation of young vines during the current year,

1) The importation and sale of cuttings of American vines is authorized.

2) The importation of any grafted or rooted vines is absolutely prohibited.

3) Every consignment of vine plants (as cuttings) must be accompained by a declaration stating the number of every species of vine contained in each case, as well as its genuineness. The declarations must be made by the sellers theneselves, and their signatares duly legalised by the administrative authorities of the country.

4) The opinion of the authorities on Bulgarian vine-culture, tonching the quality and genuineness of the vine-plants, is essential in the case of each importer, in accordance with the conditions of importation and the decrees of the Bulgarian Courts: and on no pretext can this opinion be set aside.

5) The Bulgarian State has a right of disposal of every consignment of cuttings of vine-plants imported from a foreign country.

219 **Legislation against Insect Pests and Plant Diseases in the United States.** (*U. S. Deptm Agr. Circular* No. 37). — *Noticed in Nature* No. 2195, Vol. 88, pp. 127-128. London, November 23, 1911.

United States

The effort to secure national legislation to keep out new and dangerous insect pests or plant diseases which may be brought in with imported nursey stock has been actively favoured by the W. S. Department of Agriculture, just as the department in the past has promoted and secured legislation enabling it to exclude from the country diseased animals or to quarantine and stamp out animal diseases whenever such have appeared.

The immediate danger which led to the recent effort to secure legislation was the discovery in 1909 of the abundant importation and wide distribution into the United States of nursery stock infested with brown-tail moth (*Euproctis chrysorrhoea*) (1) nests and occasional egg masses of the gipsy moth (*Porthetria dispar*) (2). During the years 1909 and 1910 such infested stock was carried into 22 States, covering the country from the Atlantic seaboard to the Rocky Mountains. During the first of these years no fewer than 7000 winter nests of the brown-tail moth, containing approximately 3 000 000 larvae, were found in shipments into New York State alone; seed material enough to infest the whole United States within a few years. During the second of these years 617 of these nests were found on nursery stock shipped into the State of Ohio, and a much larger number, approximately the same as the year previous, were again sent into New York. Smaller numbers of these nests, proportional to the amount of nursery stock received, were sent into other States east of the Rocky Mountains during both these years. Fewer brown tail moth nests were received during the season just ended (1910-11) owing to the agitation in this country and more strict supervision by foreign Governments.

. So far as possible, this stock, as voluntarily reported by customs officers and railroads, has been examined, and the brown-tail nests removed or destroyed by State authorities, or, where these were not available, by agents of the Bureau of Entomology of the United States Department of Agriculture. Undoubtedly many shipments have not been reported or examined, and it is quite probable that local infestation has already started at different interior points. The history of both the gipsy and brown-tail moths in New England shows that these insects may be present for several years without being noticed, slowly gain headway, and then suddenly develop their full power of destructiveness.

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(1) See *Bull.* Nov.-Dec. 1911, No. 3252.

(2) See *Bull.* Aug.-Sept.-Oct. Nos. 3023 and 3025.

It is scarcely necessary to comment on the danger from the careless introduction and wide distribution of these two orchard and forest pests. In a limited district in New England more than a million dollars a year have been spent for a long period in a mere effort to control these two insects, and the General Government is now appropriating three hundred thousand dollars annually to endeavour to clear them from the border of main highways, and thus check their spread.

As further illustrations of the constant risk from lack of legislation may be mentioned two very recently introduced insects which will undoubtedly prove very expensive pests in future years. The European alfalfa leaf-weevil (*Phytonomus murinus*) (1) on the authority of the entomologist of the Utah Experiment Station, Mr. Titus, was probably brought into Utah on packing of nursery stock or other merchandise from Europe This leaf-weevil has already destroyed much of the value of the important alfalfa crop of Utah and is spreading into adjacent States The other illustration is the Oriental cotton scale (*Pulvinaria Psidii*), probably the worst scale pest of citrus and other subtropical plants in southern Asia. This scale insect has recently been introduced into Florida on imported stock, and is already well established there.

Imported potatoes from Newfoundland are now bringing in the potato wart disease, (*Synchytrium endobioticum*) (2) which, wherever it has been introduced in Europe, and also in Newfoundland, puts a stop to potato culture. The importation of whitepine seedlings is now bringing in the European white-Pine blister rust, (*Cronartium ribicola*) (3) which, if established and disseminated, will destroy much of the value of our white-pine forests. The chestnut disease (*Diaporthe parasitica* Murrill) now practically shown to have been introduced on trees imported from Japan, illustrates what may quickly happen from unchecked introductions.

More than half of the important insect enemies and plant diseases now established in the United States have been brought in on imported nursery stock. Twenty different insect pests, new to the United States, some of them very formidable in the Old World, have been intercepted in the inspections of the imported material by the U. S. Department of Agriculture this year, and this does not include the introduction of brown-tail moth nests and other European pests with imported seedling stock.

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(1) Cp. *Bull.* July 1911, No 2352.

(2) Cp *Bull.* Febr. 1911 No. 610 ; *Bull.* March 1911, No. 1007; *Bull.* Nov.-Dec. 1911, No. 3280.

(3) Cp. *Bull.* June 1911, No 1928.

The San José scale (*Aspidiotus perniciosus*) had become established in California on stock introduced from China about 1870, and was known to be one of the most serious of orchard pests. A quite unimportant importation of stock from California by a prominent Missouri nurseryman in the early nineties established this scale in several eastern nurseries, and this led to the first concerted effort to obtain a national quarantine and inspection law The failure to reach an agreement among the nurserymen, fruit-growers, and entomologists as to suitable legislation prevented anything coming from this effort, although several Bills were introduced in Congress from time to time. In the meantime, the San José scale became so widely distributed by transportation on nursery stock that quarantine against this insect was no longer practicable.

In the measure now before Congress, inspection of imported nursery stock is left to the different States instead of being undertaken by the Federal Government. A complete system of notification is provided for, however, both through the requirement of a permit and by subsequent advices to be given by the customs offices, the broker or first receiver of the stock, and the common carrier transporting it.

The first clause of the Bill is as follows: It shall be unlawful for any person, firm, or corporation to import or offer for entry into the United States from any foreign country any nursery stock unless and until a permit shall have been issued therefor by the Secretary of Agriculture, under such conditions and regulations as the said secretary may prescribe, and unless such nursery stock shall be accompanied by a certificate of inspection in manner and form as required by the Secretary of Agriculture from the proper official of the country from which the importation is made, to the effect that the stock has been inspected and found free from injurious plant diseases and insect pests: *Provided*, That this section shall not be construed as applying to plants or plant products solely intended for and adapted to use as food, but to nursery stock or other plants or plant products for propagation: *Provided further*, That nursery stock may be imported for experimental or scientific purposes, without the certificate of inspection or the permit of the Secretary of Agriculture hereinbefore required, upon such conditions and under such regulations as the Secretary of Agriculture may prescribe: *And provided further*, That nursery stock imported from countries where no official system of inspection for such stock is maintained, may be admitted upon such conditions and under such regulations as the Secretary of Agriculture may prescribe.

One clause in the Bill makes provision for quarantining foreign districts or particular plant products in foreign districts to exclude diseases or insect enemies which cannot otherwise be kept out. This is the provision which has been most objected to by importing nurserymen; and especially by importers who have invested in foreign nursery enterprises in France. It is not the intention to apply this section except in the case of diseases or other dangers, which cannot be kept out by inspection or disinfection; in other words, at present it would apply only, so far as is known, to the potato wart disease and the white-pine blister rust. Another clause provides for quarantining districts within the United States where new diseases or insect enemies have gained a foothold, until such districts have been freed from such disease or insects.

RAMÓN GARCIA OSÉS **On the Danger of Introducing Insect Pests and Diseases of Plants.** (Plagas de insectos y distintas enfermedades de las plantas. Peligros de su importación sin previo reconocimiento).—*Boletin oficial de la Secretaria de Agricultura, Comercio y Trabajo*, Año VI, Vol. XI, No 3, pp. 191-192. Habana, 1 de Octubre de 1911. **220**

Cuba

The author begins with the following remark: if the damage caused to the crops of the United States by noxious insects in 1910 be valued at 6 millions of francs, how much greater must it be in countries where the plants cultivated are not protected by law from the introduction of new diseases and new obstacles to their complete development. He points out that noxious insects, when introduced into a new country, do far more harm than in their native country, as in their new habitat they are no longer held in check by their natural enemies, as was hitherto the case. He lays great stress on the necessity that the Cuban Government should organise a system of inspection of all vegetable matter imported into the island. And he lastly cites the example of Germany and Western Australia, reminding us how thoroughly the study of phytopathology is organised in the former State and the inspection of imported vegetable matter in the latter.

221 **Potatoes for Australia.**—*The Gardeners' Chronicle*, N°. 1298, Vol. L, p. 340. London, November 11, 1911.

Australia

Under the proclamation by the Governor-General of the Commonwealth, which appeared in the *Commonwealth of Australia Gazette* of March 25, 1911, it was impossible for British firms to send potatoes to Australia. The impossible condition contained in sub-clause *C* of the March proclamation has been withdrawn. The condition was that senders had to declare that the potatoes were grown at least 20 miles from any place known, after due investigation, to be or to have been within 5 years infested with either the common potato disease (*Phytophthora infestans*) or the new wart disease (*Synchytrium endobioticum*).

The new conditions are as follows

The importation of potatoes is prohibited from any country unless:

1) They are accompanied by an official certificate, dated and signed by a responsible officer of a Government department of the country of origin, identifying the potatoes; specifying the quantity, and certifying (*a*) that at the date of the issue of the certificate they were on inspection found free from disease caused by *Phytophthora infestans* (known as Irish blight) and from the disease *Synchytrium endobioticum* (known as potato corky scab, warty disease, or cauliflower disease in potatoes; (*b*) that they were grown in the country named; (*c*) that they were grown on premises known, after due investigations not to be or to have been during the preceding 12 months infested with either of the said diseases; (*d*) that they were packed in the country of origin in clean new packages.

2) The bags, crates, or other packages containing the potatoes are marked on the outside with the name of the country of origin, and with other distinguishing mark or marks.

Provided that the Minister may permit potatoes which are certified by a Quarantine Officer to be free from disease to be imported under and subject to such conditions as the Minister may think fit to impose.

This fresh proclamation was published in the *Commonwealth of Australia Gazette* on July 29, and applied to the whole of the Commonwealth, but since then, on September 16, the new conditions are repealed so far as Western Australia is concerned, and Western Australia goes back to the regulations of March 25, in so far that potatoes after being landed are to be grown for the first year in quarantine.

STATIONS FOR PLANT PATHOLOGY AND AGRICULTURAL ENTOMOLOGY.

G. BARBUT. **The Experimental Agricultural Station at Carcassonne.** (La Station Agricole de Carcassonne. Expériences contre le Mildiou et la Cochylis). — *Le Progrès agricole et viticole*, 28e année, No. 45, pp. 544-547 and No. 46, pp 574-580. Montpellier, 5-12 Novembre 1911. **222**

France

With a view to studying at first hand, in a way at once accurate, scientific and practical, the cryptogamic diseases of the vine, the vine-eating insects and the meteorological conditions affecting the development of these various pests, a Station for Agricultural Experiment was founded at Carcassonne on the 1st April last year and placed under the management of the author.

Excepting for the grant made by the Agricultural Societies, the Station is entirely subsidized by an allowance from the Commune. calculated at the rate of 10 centimes per ha. of vineyard. Private members pay an annual subscription of 16 fr. The Municipalities of the districts of Carcassone, Castelnaudary and Limoux who are within the radius of the station's field of action, responded to the appeal made to them and at the present time 140 communes subscribe, representing nearly 50 000 ha of vineyard.

At first the Station was kept up by subsidies furnished by the Syndicate of vine growers of the district of Carcassonne.

The chief aim of the Station is

1. To give notice to all subscribers, by telegraph, telephone or post, according to the urgeney of the case, of the dates suitable for taking preventive measures aganist mildew.

2. To tell them when to treat for Cochylis, Eudemis, Pyralis, *Haltica ampelophaga* and *Rhynchites betuleti*, and what mixtures to use.

3. To study local climatology and to warn agriculturists whenever any important phenomenon is likely to occur.

4. To make comparative experiments with the various insecticidal and anticryptogamic processes in the vineyard connected with the Station.

5. To distinguish between all noxious and useful insects, to define the diseases of cultivated plants and, if necessary, explain the manner of treating them.

6. To analyse at a greatly reduced rate the agricultural and viticultural products of any member of the Station.

The Station is in a position to render valuable service to vine-growers by giving them the benefit of its combined observations of a thermometric, pluviometric, hygrometric and vegetative nature, which it rests with them to turn to account by carrying out the preventive treatment immediately on receiving notice from the Station.

Since its foundation the Station has already made experiments to determine the most favourable moment for the treatment of mildew; and has also made a study of the conditions under which Cochylis and Eudemis develop, as well as the various methods so far discovered and employed for arresting the formidable diseases by which the vine is beset.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

228 P. MAZÉ. **On the Experimental Chlorosis of Maize** (1). (Sur la Chlorose expérimentale du Maïs). — *C. R. de l'Académie des Sciences,* Tome 153, No. 19, pp. 902-905. Paris, 6 Novembre 1911.

France

The Author's investigations as to the growth of maize in a nutritive solution free from bacteria gave him the opportunity of observing numerous cases of spontaneous or induced chlorosis. He was thus able to acquire the certainty that vegetable chlorosis does not describe a pathological condition. It is due, in his opinion, to a diminution of activity in the formation of chlorophyll, a function subject to the most varied influences: unfavourable meteorological conditions, excess of soluble mineral or organic substances, parasitic attacks, or the privation of certain mineral elements, produce chlorosis in maize.

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(1) See also *Bull.* Nov. 1910, p. 155; April 1911, No. 128; July 1911, No. 2275, and Nov.-Dec. 1911, No. 3229. (*Ed.*).

The Author was able to certify that the absence of sulphur or iron in nutritive solutions alone causes chlorosis in maize.

It is well-known that chlorosis has hitherto been attributed to the want of iron, and oftener than not experience has justified this opinion, since chlorosis yields to treatment by iron. But it must be remembered that sulphate of iron has always been used; so that it becomes a question whether it may not often have been the want of sulphur rather than of iron that has been remedied by this means. It is also known that calcareous soil plays a great part in producing chlorosis in the vine. But the disease nearly always yields to a treatment of sulphate of iron. In this case, however, iron is less frequently at fault than sulphur, for lime renders iron insoluble and desulphurates the soil owing to the extreme insolubility of sulphate of lime.

In the case of maize, solutions free from chlorine, magnesium, silicon, etc. do not produce chlorosis.

PH. RIVOIRE. **Drought and the Failure of Chrysanthemum Buds.** (La sèche et l'avortement des boutons des Chrysanthèmes — Le Congrès de la Société Française des Chrysanthèmes à Biarritz) *Le Jardin*, XXV année, No. 594, pp. 347-348, fig. 196. Paris, 20 Novembre 1911. **224**

France

At the XVIIth Annual Congress held at Biarritz by the Society of French Crysanthemum-Growers on the 26th, 27th and 28th October, 1911, the diseases and parasites of Chrysanthemums was the subject of the usual report by M. Chifflot of the Faculty of Science at Lyons. He points out that no new insect nor disease had appeared during 1911, but that the disastrous event of the year had been the drought and consequent failure of the buds, a disease of a purely physiological order causing a loss of from 40 or 80 %. Whatever some may think to the contrary, the cause evidently lies in the excessive heat. The drought increased the development of such insects as *Calocoris* and *Lygus*, which caused great damage, not, however, to be compared wilth that due to the excess of heat. Mr. Chifflot then goes on to speak of remedies, such as not pinching off the buds too soon, keeping the plants in the shade, syringing them, applying sulphur against insects, etc. M. Crépin next explains thut none of the buds of out-door plants dried up, but simply never developed. So that he does not attribute failure to the heat, but excess of light, the ultra-violet rays being so harmful to vegetation. Without denying the fact, M. Chifflot does not agree that it applies in this case.

M. Crépin also mentions the excessive formation of chlorophyll and the lignification of the tissues, accelerated by these ultra-violet rays.

M. Viger upholds M. Crépin's view as to excess of light, taking as an example pine-trees in the underwood, that have been protected throughout the longest drought, and other plants such as dahlias that have never flowered though regularly watered.

M. Crépin speaks of the successful results obtained by using packing-cloth as a means of protection.

M. Harman-Payne says he is convinced from personal observation, of the utility of cultivating the chrysanthemum under glass, as in America and even in England, during the entire period of its growth, the plants being placed in large cement basins.

M. Chifflot next reviews the various memoranda and reports relating to the subject in hand, written by M. M. Chambry of Souffas; Croizier, of Escurolles; Nizerin, of Allex; Georges Paul, of Allain; Salom, of Algiers; and Thiriat, of Vassy. Opinions differ, but every one holds the heat responsible, with the exception of M. Salom, who is reminded that the climate of Algiers has been more favourable than that of France during 1911.

225 L. Ravaz and G. Verge. **Effect of Drought on the Vine.** (Sur quelques effets de la sécheresse. Conséquences à en tirer pour la Taille de la Vigne). — *Le Progrès agricole et viticole*, 32ème année, No. 47, pp. 602-608. Montpellier, 19 Novembre 1911.

The Authors made numerous experiments in connection with the effects of drought on the vine and the consequences to be drawn from it with regard to pruning the plant.

France

These experiments enabled them above all to establish the fact that the sensitivenes of the vine to drought depends on the number of bunches borne by each plant.

In dry soil, the Authors think it advisable, when pruning the vine, not to preserve more than a very limited number of fruit-buds, reducing the number and length of the spurs; to increase the space allotted to each plant, *i e.* the volume of soil and water whence the roots draw nourishment; always to keep the surface of the soil free from weeds, and by ploughing and loosening of the soil about the roots, to enable the rain to penetrate to the sub-soil.

The experiments made by the Authors prove, indeed, that excess of bunches makes the vine more sensitive to drought by exhausting it. Might not manure, generously administered, play an important part here?

Besides, as compared with the leaves, the power of evaporation in the grapes is very small.

The bunches, in perfect condition, cannot of themselves absorb rain or other water.

226 B. F. FLOYD. **Die Back Melanose, Yellow Spotting and Frenching of Citrus Trees.** Report of Assistant Plant Physiologist. — *Florida Sta. Rpt.* 1910, pp. LXVI-LXXVIII figs. 4. *E. S. R.*, Vol. XXV, No. 5, pp. 456-457. Washington, October 1911.

United States

The work during the year 1910 has been a continuation of previous investigations (*Florida Sta. Rept.* 1909, pp. LXIII-LXXVIII, figs. 16) on the abnormal tissues of citrus trees affected with " die back ", " melanose ", " yellow spotting " and " frenching ".

Experiments with different fertilizers, especially nitrogenous, on the spotting of citrus leaves and the subsequent leaf fall showed that this spotting was probably due to nutrition disturbances initiated by the use of nitrate fertilizers, but could be counteracted by the addition of a phosphatic fertilizer.

Experiments on the use of copper sulphate as a treatment for " die-back ", in which 4 gm. of the copper salt in powdered form was inserted beneath the bark of diseased trees, showed after a lapse of about 21 months no beneficial results in controlling the disease. All untreated trees and 35 out of 46 diseased treated trees showed some symptoms of " die-back " at the close of the treatment.

However, all the trees, both treated and untreated, showed a decided improvement in their general appearance, and the die-back symptoms on both sets were much fewer than at the beginning of the experiments.

227 S. MOTTET. **Coniferous Trees and the Drought,** (Les Conifères et la Sécheresse). — *Revue horticole,* 83^{e} année. No. 21, pp, 508-509. Paris 1er Novembre 1911.

France

Chief among the various coniferous trees that suffered from the dryness of the atmosphere prevalent in France during the summer of 1911, were species of. *Picea and Thuya.* Pines and Firs on the other hand, for the most part, hardly suffered at all.

It is a notable fact, too, that. the North American, Mediterranean and Oriental Conifers suffered very little, as a whole, from the summer of 1911, whilst many of the Japanese or Asiatic varieties either suffered or died.

Further all those species or varieties of Conifers whose foliage is glaucous, were perfectly able to withstand the great heat and dryness of the atmosphere. It seems natural to admit that the bloom to which these species of trees owe their glaucescent appearance had served the purpose of a protecting mantle by reflcting the burning and luminous rays.

DISEASES CAUSED BY BACTERIA AND FUNGI

GENERALITIES.

228 G. Pollacci. **The Hydrophobia Parasite and *Plasmodiophora Brassicae* Wor Inquiry into their Morphological and Physiological Affinity.** (Il parassita della rabbia e la *Plasmodiophora Brassicae* Wor. Ricerche sui loro rapporti di affinitá morfologica e fisiologica. Comunicazione preliminare). — *Bollettino della Società botanica italiana*, No. 8, pp. 278-283. Firenze, Novembre 1911.

Italy

In studying the first stages of the development of *Plasmodiophora Brassicae* Wor., the Author notices the resemblance of certain of its forms to what are called " corpi del Negri ", discovered by Dr. Negri in 1903 in the nervous system of animals attacked by hydrophobia, and which he considers to be parasitic organisms (protozoa) and the specific agents of hydrophobic infection.

The comparative study of these " corpi del Negri " and *Plasmodiophora Brassicae* leads the Author to the conclusion that the hydrophobic parasite (designated *Neurorycles hydrophobiae*) has points of affinity with the genus *Plasmodiophora*, which he separates from the group of the Myxomycetes, connecting it instead with that of the Haplosporidia.

The author hesitates about giving further details or more definite conclusions before having completed his researches.

BACTERIAL DISEASES.

Bacterial and Insect Pests of the Sesamum Plant (***Sesamum indicum***) **Linn., in British India..** (Cultivation, Production and Utilisation of Sesamum Seed). — *Bulletin of the Imperial Institute*, Vol. IX, No. 3, pp. 264-265. London, 1911. **229**

British India

The sesamum plant appears to be attacked by few diseases; but two forms of bacterial disease have been recognised : one due to *Pseudomonas Sesami* and the other to *Bacillus Sesami*. The occurrence of disease is made evident by the wilting of the plants, followed by their destruction. Moist soils favour the development of disease. It is stated that treating the seed with formalin, before sowing, is a useful preventive of fungoid disease.

In India the larva of *Antigastra catalaunalis* Dup., is a common pest on sesamum plants. The larva rolls the leaf of the plant or bores into the capsule. Although it occurs commonly only in the rains, it breeds throughout the year if the food-plant is available.

The caterpillar of *Acherontia Styx* Westw. has been found attacking the leaves of cold weather crops of sesamum in the Central Provinces, British India. The moth is widely distributed throughout India and the Far East generally, and in some seasons is fairly abundant. The eggs are laid on the leaves and the caterpillar feeds on the plant during the whole of the larval stage, which lasts about two months. When about to pass into the pupal state it leaves the plant for the ground. The only remedy for this pest is hand picking. As the caterpillars are large they are easily recognised, and may be killed by being placed in water. Another pest is the larva of one of the longicorn beetles (Cerambycidae) known as the « sesamum stem-borer ». The eggs are laid on the under surface of the sesamum leaves, and on hatching out the larva tunnels into the mid-rib and makes its way down the petiole into the stem and thence to the roots, where it hibernates. The presence of this pest on the leaves of the plant may be detected by their withered and curled condition. The only remedy is to remove the affected leaves by hand-picking before the larvae reach the stem. For this purpose the affected crop should be looked over two or three times, at intervals of from ten to twelve days. If once allowed to enter the stem the pest cannot be destroyed without sacrificing the plant.

FUNGOID DISEASES.

280 H. S. Fawcett. **Report of Plant Pathologist.** — *Florida Sta. Rept.* 1910, pp. XLV-LXV). — *E. S. R.*, Vol. XXV, No. 5, pp. 450-452. Washington, October, 1911

United States : Florida

The work of the year consisted mainly of investigations into the diseases of citrus trees, including " stem-end-rot ", " gummosis ", " scaly bark " (1), " scab " (*Cladosporium Citri*), " silver scurf " and " buckskin ". Studies were also made of the " red rot " of sugar cane (*Colletotrichum falcatum*), of the spore stages of the brown fungus of the " whitefly " (*Alcyrodes Citri*) which is described as new under the name of *Aegerita Webberi*, and of a species of scaly fungus from *Lecanium* on *Pinus Taeda*.

The " stem-end-rot " is a disease only recently observed on nearly all varieties of citrus fruits in Florida, but is now reported from 20 localities with its focus of infection in Volusia, Lake and Orange counties.

It has caused damage ranging from 5 to 30 per cent of the fruit in infected groves. The fruit first softens and becomes slightly depressed around the stem end without any change in the color of the rind. The rot proceeds inward along the fibers of the rag, and then outward into the pulp cells.

At first there is no discoloration of the rind and pulp, but as the softening continues the rind turns a dull brown and the rag and pulp cells disintegrate, causing the entire fruit to become soft and mushy The rot usually occurs on full-sized ripening fruit after it has dropped or has been picked, but may begin while the fruit is still on the tree. It also develops on fruit which is apparently perfectly sound when packed. Pure cultures have been isolated from the interior of diseased grape-fruit, sweet and sour oranges, and from tangerins. Inoculation tests with pure cultures and with pieces of diseased tissue produced typical "stem-end rot" in the sound fruit, mainly of oranges, after an incubation period of about 2 weeks. These inoculation experiments showed that under laboratory conditions the infection of sound oranges may occur not only through the cut ends of stems up to 3 in. long, but also through the epidermis of the fruit and through the calyx, and that infection of oranges and lemons may occur in water either from cultures, pieces of diseased orange tissue, or infected soil.

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(1) The initial cause of « Scaly bark » is a fungus belonging to the genus *Hormodendron;* it seems that « Withertip fungus » (*Colletotrichum gloeosporioides*), associated with the *Hormodendron* as a secondary agent, causes most of the injury from the disease. (Cf. H. S. Fawcett, *Florida Sta. Rep.*, 1909). (*Ed.*).

A description of "gummosis", and distinctions between it, "scaly bark" and "foot rot" (*Fusarium Limonis* Briosi) are given, and the following methods of treatment are suggested: Either scrape off the diseased bark and paint the surface with a carbolineum mixture consisting of 1 gal. of carbolineum and 1 gal. of water in which 1 lb. of whale-oil soap has been dissolved, or peel off the bark over the diseased area without injuring the underlying wood and cover the wound with a grafting wax consisting of 6 oz. of alcohol, 1 lb. of resin, 2 oz. of tallow, and 1 oz. of spirits of turpentine.

A further test of the methods of controlling "scaly bark" shoved that the line of treatment depends upon the condition of the trees and of the grove as a whole.

If the disease is of recent appearance in the locality and is confined to 2 or 3 trees in a grove, the infected trees should be cut back to the stump and treated as previously suggested. If the disease is of long standing in a grove in which the trees are still looking fairly well, a thorough pruning out and spraying with Bordeaux mixture will effectually check its growth. When he trees are badly diseased, showing much dead wood and weake limbs covered with scaly bark spots and spongy bark, they must be headed back in December and January, cutting out all the foliage and small branches and leaving only the body and larger limbs; the entire surface should then be painted with the carbolineum solution.

An extended study of "citrus scab" or "verrucosis" has been made, the results of which will be published later. In the spraying experiments for controlling this scab it was found that trees sprayed with Bordeaux mixture in November and again the following March were entirely free from the disease. The use of a carbolineum emulsion, even up to 25 per cent in strength, was less effective than the Bordeaux mixture.

In studying "silver scurf", sometimes called "thrip marks", the conclusion was reached that a species of fungus, probably a *Conothecium*, is one of the main factors in producing the disease.

The characteristics of the "red rot disease" of sugar cane as it exists in Florida and methods for its control are given. The use of only healthy seed canes, dipping the seed canes in a 5 : 5 : 50 Bordeaux mixture just before planting, fall planting of the canes in place of bedding them, the burning of all trash in the old bed and of all diseased canes, and the gradual introduction of immune seedling varieties are suggested as remedies for combating this disease.

281 EMIL WERTH. **Biology of *Ustilago antherarum* Fries.** (Zur Biologie des Antherenbrandes). — *Arbeiten aus der Kaiserlichen Biologischen Anstalt für Land- und Forstwirtschaft*, VIII Band, 3 Heft, pp. 427-450, text-abb. 4. Berlin, 1911.

Germany

The following experiments were made with *Ustilago antherarum* (*U. violacea*):

1. Flowers of a female plant of *Lychnis alba* (*Melandryum album*) were infected with spores of *Ustilago antherarum*; inspection showed that the progress of the fungus in the host was very slow. Thus, a plant inoculated on the 18th and 22nd of Jnne, 1909, showed on the 20th of August 22 normal flowers with a few diseased and appearing hermaphrodite. On August 27, the same plant showed 4 healthy and 4 diseased flowers; on September 30, 2 healthy and 6 diseased. A plant inoculated in 1908 did not produce diseased flowers till the middle of the following May. While the disease was slowly spreading in the host, interesting flowers were observed intermediate between the normal ones and the apparently hermaphrodite diseased ones; in them neither the androecium nor the gynoecium was properly developed.

2. Flowers of a male plant were inoculated with like result; the infection spread slowly through the host. The male flowers are not appreciably altered in appearance, except that their anthers are full of the spores of the fungus.

3. Plants were grown under glass from seeds from infected flowers of the previous year; some of them flowered the first year and showed no infection. All experiments made so far have given the same result, however abundant was the fungus on the parent plant.

This is in accordance with Hecke's results, and shows that the old idea of infection of the unripe seeds in the flower was erroneous.

4. Spores of the fungus were placed on young shoot-buds of *Lychnis*. In one case infection resulted, thus confirming Hecke's results.

5. Infection of young plants was obtained by sowing the seeds in soil infected with spores of the fungus.

Owing to poor conditions of culture, this series of experiments gave small results, but they were sufficient to confirm Hecke's similar ones.

6. In experiments with female flowers it was found that the spores did not penetrate the stigma directly by germ-tubes — as with wheat and barley smuts (*Ustilago Tritici* and *U. nuda*) — or by the germination of sporidia. The spores stick to the papillae of the stigma and remain unchanged while these remain fresh and turgid; but when the papillae become soft and collapse, the fungus spores begin to form promycelia, sporidia, and secondary sporidia. Owing to general decay of the tissue of the host plant, the actual point and manner of entry were not ascertained.

7. Observations, and examination of the stigmas, have shown that healthy plants of *Lychnis* receive the visits of pollen-bearing insects as much as diseased ones; so that insects may play an important part in spreading the disease.

8. Study of a large number of wild plants of *Lychnis* has shown that the female plants infected are much the most numerous; so it appears that *Ustilago antherarum* is a form adapted for dispersal by flower-seeking insects.

The life-history of the fungus may be summed up as follows:

a) Insects visiting the flowers (moths seeking nectar, and bees collecting the fungus spores) carry the spores to the stigmas of healthy flowers of the host plant.

b) The spores do not penetrate directly into the stigma; but when the stigma is dead, the fungus starts a saprophytic existence, with repeated formation of conidia.

c) This shows that, contrary to what occurs in wheat and barley smuts, *Ustilago antherarum* has other means of infection. These are: infection of male flowers.

d) infection of young shoots, and

e) infection of seedlings.

f) The action of the parasite shows itself in a slowly-spreading infection of the host plant shown by the formation of spore-masses in the anthers.

g) In the flowers of female plants, the anthers, normally abortive, develop, while the gynoecium becomes reduced in size and functionless. Thus the flowers appear hermaphrodite but are really barren; in cases of partial infection of the flower-buds, interesting forms occur, intermediate between the normal female flowers and the pseudo-hermaphrodite ones attacked by the fungus.

h) The method of infection described in *b*) explains how it is that direct infection of the flowers has no influence on the resulting seeds, which give rise to healthy plants.

282 EMILIO INGLESE. **A New Contribution to the Study of Tobacco Fumagine.** (Ulteriore contributo allo studio della fumaggine del Tabacco). – *Bollettino tecnico della Coltivazione dei Tabacchi. R. Ist. sperim. in Scafati (Salerno).* Anno X, No. 5, pp. 255-267. Scafati, settembre-ottobre, 1911.

Italy

The Author has been led, by personal observation, to think that honey-dew, which forms the sugary substratum indispensable for the growth and diffusion of fumagine is due to a pathological state inherent in the constitution of plants (1). In the present memorandum, he describes the experiments made by him in proof of the correctness of his theory.

In order to discover whether the secretion of honey-dew be influenced by a sudden lowering of temperature, the Author selected some strong, healthy plants, about one third of their normal size, subjecting them to the following treatment:

1. He first poured cold water into a hole made round the neck of the plant which was thus immersed in a temperature of 30° for the foliage; 27° for the extremities of the roots (at a depth of 30 centim.); and 12° for the end of the stem and the upper roots.
2. He then placed two vessels full of ice close to the plant, covering both plant and vessel with a bell-glass, so that the plant was surrounded by a temperature of 28° at the top and 9° at the bottom.
3. He placed some ice round the roots of the plant, covering the ice with earth.
4. (Experiment made with two plants one quarter grown, and consequently more delicate than the preceding). He poured water at 3° upon the foliage of plants immersed in an atmosphere of 30° temperature.

All the plants thus treated continued to grow and thrive normally till harvest-time, in the same way as healthy plants that had never been subjected to any kind of treatment.

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(1) See *Bull.* May 1911, No. 1543. (*Ed.*)

Besides this, the Author determined to reverse the process, in order to study the effect produced on plants by a rapid rise of temperature. This he effected.

5. By placing over the plant a bell-shaped metal covering supplied with steam.

6. By watering the plant with water at 56°.

7. By covering the plant with the aforesaid metal bell (heated in the sun), and placing beneath it, close to the plant, a vessel containing chloride of lime.

This treatment had no more effect than the former in disturbing the functions of nutrition and circulation.

The observation of natural phenomena also confirms the fact that inequalities of temperature are not the direct cause of the secretion of honey-dew. Thus it is that for the last 10 years it has never happened, in the province of Palermo, as a consequence of the cirocco, a wind invariably inducing a sudden rise of temperature.

Frank D. Kern. The Rusts of Guatemala II (1) — *Mycologia*, Vol. III, No. 6, pp. 288-290. Lancaster, Pa., November 1911. **288**

The first article of this series was published in 1907 in the *Journal of Mycology*, vol. 13, pp. 18-26. The specimes upon which both papers have been based were collected in Guatemala by Prof. W. A. Kellerman (except one specimen by Pr. W. Trelease) and placed in the hands of the writer for identification and study. The following is a list of the species here recorded and of their host plants: *Ravanella Mimosae-albidae* Dietel on *Mimosa albida floribunda*; *Cyanothrix praelonga* (Winter) Arth. on *Eupatorium populifolium* H. B. K.; *Calliospora Diphysae* Arth. on *Diphysa* sp., *Puccinia gregaria* Kunze (= *Dasyspora faveolata* Berkeley & Kunze) on *Xylopia* sp.; *Puccinia Lippiae* on *Lippia myriocephala* Cham. and Schlecht.; *Puccinia Polygoni-amphibii* Pers. on *Polygonum* sp.; *Puccinia inanipes* on *Eupatorium tubiflorum* Benth.; *Puccinia Eleocharidis* Arth. on *Eleocharis* sp.; *Uromyces appendiculatus* (Pers.) Fries on *Phaseolus atropurpureus* Moc.; *Uromyces leptodermis* Sydow on *Panicum barbinode* Trin.; *Uromyces proeminens* (D. C.) Pass. on *Euphorbia lasiocarpa* Klotzsch.; *Uromyces Rubi* Diet. and Holw. on *Rubus glaucus* Benth. and on *R. poliophyllus* Focke; *Uromyces Gouaniae* sp. nov. on *Gouania domin-* **Guatemala**

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(1) *Contribution to Guatemalan Mycology*-V. (The first three papers in this series were by W. A. Kellerman, the fourth by the writer).

(*Author's note*).

gensis L. (there is no other species of *Uromyces* known on this or any closely related host, *Uredo Gouaniae* Ellis and Kelsey is doubtless the uredinial stage of *Puccinia Gouaniae* Holw.); *Aecidium Loranthi* Thüm. on *Loranthus* sp.; *Uredo malvicola* Speg. on *Malvaviscus* sp.

RESISTANT PLANTS.

284 AIELLI-DONNARUMMA. **Hybrid Tobacco able to withstand the Attacks of *Thielavia basicola* Zopf.** (Meticci pesanti refrattari alla *Thielavia* al campo). — *Bollettino tecnico della Coltivazione dei Tabacchi, R. Istituto speriment. in Scafati (Salerno)*, anno X, No. 5, pp. 277-281. Scafati, settembre-ottobre, 1911.*

Italy

As far back as 1906, in the commune of Cave dei Tirreni, in the province of Salerno, the Authors undertook experiments with certain heavy hybrid tobaccos, making the "Italia" variety their basis. By crossing the "Italia" with "Kentucky", they obtained, by selection, two different types, one of which (type B) is remarkable for the general vigour and hardiness of the plant, for its precocity either in nurseries or in the open field, and also for the breadth of the leaves and the delicacy of their venation. The "Italia" × "Kentucky" hybrid, type B, gave better results in the commune of Cava dei Tirreni than did any of the other hybrids produced by Prof Angeloni at the Royal Experimental Institute of Scafati. In 1911, out of the 66 plantations scattered throughout the commune, with a total of about 320 000 plants, not one of them was attacked by *Thielavia*.

The hybrids "Italia" × 3 "Kentucky", "Moro" × 3 "Kentucky" and "Salento" × "Kentucky", particularly the two latter, also produced good results, giving special proof of being unusually adapted for crossing purposes.

The Authors several times found that heavy hybrids, most closely allied by their characteristics with the "Kentucky" type, are subject to more or less acute attacks of *Thielavia*; whence arises the necessity of choosing types in which the "Kentucky" element does not predominate. For instance: the "Italia" × 3 "Kentucky" hybrid, which might be taken as an ideal type, like the "Italia" × "Kentucky", is almost as difficult to cross in the open field as the

"Kentucky" itself, for the very reason that in it the "Kentucky" element predominates. The only exception to this is seen in the case of the "Moro" × 3 "Kentucky" although here too there is a high percentage of the latter element; but the reason must be found in the refractory nature of the "Moro".

As to results, all heavy hybrids cultivated in the commune of Cava were more productive than the "Kentucky" (yielding from 10 669 to 13 513 leaves per are, — 4 poles).

MEANS OF PREVENTION AND CONTROL.

G. Bellini. **Efforts for the Prevention of "Bacterial Tumours" in the Olive *(Bacillus Oleae)*.** (Meglio prevenire che combattere la rogna dell'olivo). — *Il Coltivatore*, anno 57°, No. 32, pp. 431-433. Casale Monferrato, 20 Nov. 1911. 285

Italy: Tuscany

The Author describes the first results of his experiments in Tuscany to ensure the prevention of the spread of "Bacterial Tumours" in the Olive (*Bacillus Oleae*); as, from his point of view, all means of prevention hitherto adopted are of very negative value.

In April 1910, a violent hail-storm caused great damage in a large olive-yard of about 2 500 ha., situated near the farm Monteverdi. The small branches beaten by the hail were first removed; then, the other branches and the stem of each plant were covered with a mixture composed of water (100 litres), sulphate of iron (15 kg.), and slaked lime (15 kg.) (1). At the same time the olives were treated with a copper-lime mixture formed of sulphate of copper (0.8 kg.) slaked lime (0.8 kg.), and water (100 litres). Besides this the "tumours" of the Olives already attacked by the disease were removed and the scars treated with the sulphate of iron and lime.

Up to the present time, no tumour produced by *B. Oleae*, has appeared in this olive-yard and the olives are full of promise for next year's harvest.

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(1) 1 kg per 100 litres of water = 1 %, or 1 lb in 10 gallons. (*Ed.*).

286 O. Appel and E. Riehm. **Treatment of Wheat and Barley Smuts (1).** (Die Bekämpfung des Flugbrandes von Weizen und Gerste). — *Arbeiten aus der K. Biologischen Anstalt für Land- und Forstwirtschaft*, VIII Band, 3 Heft, pp. 343-426, 1 Taf., 2 Textabb. Berlin, 1911.

The authors sum up their work as follows:

Germany The frequent appearance of wheat smut (*Ustilago Tritici*) and barley smut (*U. nuda*) makes it essential that treatments should be carried out much more often than has been the case up to the present.

No general method of treatment has been practised, as none was known which was efficacious in all cases. The finding of such a method was made more difficult by the lack of discrimination as to the specific differences of the smut fungi on different plants; also owing to their biology, particularly the mode of infection, being till recently insufficiently known. It was not till Brefeld had shown that infection took place in the flowers, and Hecke had determined the presence of mycelium in the caryopsis, that the foundations of a scientific treatment of the disease were laid. Brefeld had concluded from his observations that treatment of the grain was useless for smut, but this was shown to be erroneous by Jensen's practical experiments, in which he made a successful treatment of smut by subjecting barley, previously moistened, to a temperature of 52° to 53° C (125° to 127° F). A study of the germination of the fungus showed that when the dormant mycelium in the grain has been roused to activity by causing the grain to absorb moisture, it can be killed by treatment with hot water or hot air.

It had been shown that certain chemicals (sulphate of copper, formalin, creolin) had no action, further that elimination of the smallest grains was useless. Again, attempts to obtain seed free from smut by removing the diseased plants from the crop gave no definite results. The raising of resistant varieties was also not a success. Consequently, the authors undertook experiments on the method of heating following on moistening, which had been shown to be possible in practice.

Their work shows that the conditions of moistening and the temperature of the water used have some influence on the result of the treatment. With water at 25 to 30° C. (77 to 86° F.) the action on the mycelium is most rapid, taking place in four hours. If cold water has to be used, the soaking must go on longer. Where hot air is used for the subsequent treatment it is deemed advisable to use as little water as possible for the soaking. The minimum quantity necessary seems to be about 17 % for wheat, and slightly more for barley. If warmer water (at 40° C. = 104° F.) is used for soaking the grain, the mycelium is killed in about 8 hours without further treatment; even after 6 hours at this temperature, a marked diminution in infection results.

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(1) See *Bull.* April 1911, No. 1286. (*Ed.*).

The duration of the principal treatment differs according as hot water or hot air is employed· with hot water, a temperature of 50 to 52° C. (122 to 125.5° F.) must be maintained for 7 to 10 minutes; with hot air, the apparatus must be regulated so as to heat the grain to 50° C. (122° F.) for 5 minutes. In the laboratory apparatus devised by the authors, the moistened grain was subjected to 55 to 60° C. (131 to 140° F.) for 20 minutes. In any case, a rapid cooling directly after the treatment is necessary.

Considering the difficulty of adopting in practice methods recognized as being good in theory, it seemed desirable to try this treatment for smut under pratical conditions. The hot water method was found to be adaptable to the most varying conditions. The soaking occasionally offers slight difficulties for very large quantities. The main treatment may be carried out by immersion; in this case, large vats should be used, to avoid changes in temperature. Immersion treatment is facilitated by Ventkzi's evaporator, modified by Schander. The method for passing hot water under pressure through the pile of grain (by means of the Appel-Gassner apparatus) also gives good results ; with apparatus of this type the heating is more intensive, so that a shorter time (7 minutes) is enough. Other methods consist in passing the grain through hot water ; placing it in water heated by a current of steam ; or in placing it in a vessel kept at a constant temperature.

The disadvantage of all these hot water methods is that the grain swells up a good deal, and in abnormal weather, may suffer owing to the impossibility of drying it before sowing. Drying before sowing is advisable, as by this means the'alteration of germinative power, produced by the hot-water treatment, largely disappears in time.

There is not at present any special apparatus for the hot-air treatment on the market ; true, Gisevius and Böhmer have constructed such a one, but according to their own account it requires perfecting. The authors used ordinary drying apparatus for their experiments ; these comprised stove driers, hot-pipe driers, and aspiration driers. With the two first they got a decided reduction in smut; but the heating is so irregular that it is impossible to be safe from serious damage to the germinative power. The best results were obtained by aspiration apparatus.

When the methods described above are carefully carried out, the normal germinative power of the grain is not appreciably injured; but it would always be advisable to make a trial with a small quantity first. If hot water is to be used, it would be enough to dip a portion of the moistened grain into the hot water, then dry it, and test its germination. For the preliminary trial with hot air, a laboratory desiccator, like the one devised by the authors, might be used.

287 ALBERT DICKENS. **Results of Spraying Apples.** — *The Southern Fruit Grower*, Vol. XV, No 11, p. 309. Chattanooga, Tenn., November, 1911.

United States: Kansas

From experiments carried out by the writer at the Kansas Agricultural Experiment Station the following conclusions are arrived at

1. Commercial results from seven widely separated orchards, including both commercial and home types and composed of the varieties of apples recognized as standard in Kansas, carefully sprayed show an average gain of 4 bushels in actual yield of merchantable fruit per tree, or 37 per cent. compared with untreated parts of the same orchards.

2. The average percentage of number 1's and number 2's, which are the high-priced grades, is also increased by 15 per cent and 6.6 per cent, respectively.

3. The average net profit from spraying is shown to be 1.62 dollars per tree, or 97.20 dollars per acre when the fruit is sold as "orchard run" and to be almost doubled if properly graded and marketed.

4. All seriously injurious insects and fungous diseases have been markedly reduced and most of them have been made almost negligible.

5 Prepared lime-sulphur plus arsenate of lead has produced the best results on apples subject to Bordeaux injury and nearly

free from apple blotch (1), while Bordeaux mixture plus arsenate of lead gave best results on varieties attacked by apple blotch.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS.

Wheat Rust in the State of Paraná Brazil. — See above, No. 11. **238** **Brazil: Paranà**

Diseases of Maize grown in Nutritive Solutions. See above, No. 110. **239** **Germany**

FR. BUBÁK and P. KOSAROFF. **Fungi parasitical on Maize, Vine and *Hibiscus esculentus* in Bulgaria.** — (Einige interessante Pflanzenkrankheiten aus Bulgarien). - *Centralblatt für Bakteriologie, Parasitenkunde u. Infecktions-krankheiten*, 31 Bd., No. 16-22, pp. 495-502, Taf. I-II, 3 Abt. Jena, 10. November, 1911. **240**

Description of new parasitical fungi discovered in 1909, in Bulgaria. These are *Fusarium maydiperdum* Bubák. sp. nov., which induces a sort of rotting of the Maize cobs, *Ciniosporium Gecevi* Bubak sp. nov. which attacks and blackens stems of the same plant; *Phyllosticta dzumajensis* Bubák sp. nov. and *Microdiplodia vitigena* Bubák sp. nov. both of which develop on the leaves of the Vine, without, however, causing them any appreaciable injury. **Bulgaria**

Other species of fungus have also been noticed on ears of Maize attacked by *Fusarium maydiperdum* they are as follows: *Fusarium lateritium* Nees, *Tricothecium roseum* Pers. and *Sordaria fimiseda* Rob., which cannot, however, be considered as the cause of the above-mentioned disease.

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(1) Apple Blotch (*Phyllosticta solitaria* Ell. et Ev.). Recognized in 1897 on apples coming from Maryland and Texas, since then frequently seen in the eastern part of the United States though not as a very serious pest. Its most destructive centre heretofore has been in the Ozarks of Arkansas and Missouri, where 75 per cent of the crop is commonly rendered unfit for barreling. One connty alone is estimated to have suffered a loss of 950 000 dollars (STEVENS and HALL, *Diseases of Economic Plants*, pp. 76-77. New York, 1910). (*Ed.*).

Mention is made also of the discovery in Bulgaria of *Oidium Abelmoschi*; this species, discovered in Egypt in 1876, on *Abelmoschus moscatus* Med., and subsequently found in Greece, had not been met with elsewhere till 1907, when it again re-appeared on the leaves of *Hibiscus esculentus* L., at Sadovo. In 1909 it again made its appearance in Bulgaria, on the same plant, called by Bulgarians " bamia ,, which they cultivate in market gardens.

Besides *O. Abelmoschi*, perithecia have been observed in Bulgaria on the leaves of *Hibiscus esculentus*, and have been identified as those of *Erysiphe Cichoriacearum* DC., to which indeed *O. Abelmoschi* is allied by its conidial form. Lastly a new species of *Cicinnobolus* was found on *O. Abelmoschi* iself, and has been designated *C. Abelmoschi* Bubák, sp nov.

241 **Wart Disease of Potatoes in Great Britain in 1911** (1). - *The Journal of the Board of Agriculture*, Vol. XVIII, No. 8, pp. 669-670. London, November, 1911.

Great Britain

A large number of cases of Wart Disease or Black Scab in potatoes (*Synchytrium endobioticum*) have been reported to the Board of Agriculture of Great Britain during the present season. In nearly every instance, however, the outbreaks have occurred in districts in which the disease has been present for years, and in the great majority of cases on allotments and small gardens. Several places in which disease was recorded in previous years have been ascertained to be free from disease this year. These are of two kinds: first, those outside the infected area, where the evidence shows that the original outbreak was due to infected seed, and not to infected soil; secondly, those, chiefly within the infected area, where the growers have planted one of the varieties recommended by the Board of Agriculture as resistant under ordinary circumstances. There are a large number in the latter category.

The hot weather of the past summer does not appear to have had much effect in checking the development of the fungus. Badly infected localities, where no precautions have been taken, have yielded potatoes as badly infected as ever, and very few growers who had disease in 1910 escaped in 1911, except where disease-resisting varieties have been grown.

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1) Cf *Bull* Feb. 1911, No. 610; March 1911, No. 1007; Nov.-Dec. 1911, No. 3280, also, see above No. 221 (*Ed.*).

The disease, however, has often appeared in a different form. The warty outgrowths which are characteristic of the attack have appeared on the stem and leaves, as well as on the tubers, and cases have been reported where the whole of the disease has appeared on the parts of the plant above the ground, while the tubers remained free. A case has been found where the stem of a potato plant was bearing leaves which had been entirely distorted by the fungus. Another case has been found where an underground branch of a potato plant bore a healthy tuber and at the end of the shoot a leaf very badly distorted. The appearance of the fungus on the part of the plant above ground has been of great assistance in the detection of disease.

The article is illustrated by a plate.

JOHN MC CALL. **Seed Potatoes and Irish Blight** (1). — *The Agricultural Gazette of Tasmania,* Vol. XIX, No. 10, p. 497. Hobart, October, 1911. **242**

Great Britain

The writer (Tasmanian representative in London) has been making enquiries in Great Britain and Ireland with a view to ascertain whether or not it might be possible to obtain seed potatoes which would fulfil the requirements of the Commonwealth Government under the " Quarantine Act ". However, neither the Board of Agriculture and Fisheries of Great Britain nor the Department of Agriculture for Ireland can undertake to guarantee any potatoes grown in the parts of the United Kingdom under their jurisdiction as free from blight.

The Secretary of the Department for Ireland states that it is not practicable by means of a superficial examination to ascertain definitely whether certain tubers are affected or not with the disease. In fact, potatoes which are apparently free from blight when being packed for export may show signs of a disease in the course of transit, and accordingly be condemned on arrival at the port of landing.

Although potato blight has existed in the United Kingdom for a very long time, there has been practically no diminution of the acreage under this crop. In 1910 Great Britain had 539 684 acres under potatoes, giving an output of 3 477 139 tons; or 6.44 tons per acre. Ireland in the same year had 592 985 acres, with a total output of 2 870 827 tons: an average of 4.84 tons per acre. The total figures for the United Kingdom (*viz.* 1 132 669 acres yielding 6 347 966 tons; or an average of 5.60 tons per acre) show that, notwithstanding the prevalence of blight and other potato diseases, there is still a large area under cultivation, and that, by means of proper spraying and treatment, the farmers in the United Kingdom are able to obtain a fair yield.

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(1) See *Bull.* Feb 1911, No. 589; and June 1911, Nos. 1910 and 2019. (*Ed.*).

243 Germany

Diseases of Sugar-Beet grown in Nutritive Solutions. — See above, No. 110.

244 Scotland

Diseases of Turnip-Swede Hybrids in Scotland. — See above, No. 82.

245 Brit. India

Bacterial Diseases of Sesamum. — See above, No. 229.

246 Bulgaria

Fungi attacking *Hibiscus esculentus*. — See above, No. 240.

247

A Cucumber and Melon Disease New to Britain (*Colletotrichum oligochaetum* Cavara). — *The Journal of the Board of Agriculture*, Vol. XVIII, No. 8, pp. 670-671. London, November 1911.

Great Britain

During the present year examples of a disease known as *Colletotrichum oligochaetum* Cavara, which attacks melons, cucumbers and other cucurbitaceous plants, have been sent to Kew for investigation from various districts in England. The fungus has been prevalent in France and Italy for some time. All parts of cucumber plants are liable to attack, and, when the soil is infected, seedlings soon succumb. Spots are formed on the leaves of older plants, but the areas affected in this way do not fall away completely as they do in the case of the cucumber disease caused by *Hormodendron Hordei*. Large sunken patches are formed on the fruits, which soon die. The spores of the fungus arise in small pustules on the parts attacked and readily spread the disease to healthy plants. It has been found that spraying the plants either with liver of sulphur — 1 ounce dissolved in 3 or 4 gals. of water — or with self-boiled lime-sulphur mixture checks the progress of the disease. Diseased leaves and fruit should be removed during the early stage of the disease, before the spores are mature. « If this precaution is neglected the houses become infected, and the epidemic becomes more serious and more difficult to combat year by year, as has recently been the experience of growers in the case of *Hormodendron Hordei*, from an epidemic of which one grower lost £2 000 in one year ».

The article is illustrated by a plate.

Fungi on Vines in Bulgaria. — See above, No. 240. **248 Bulgaria**

F. T. BROOKS. **Silver-leaf Disease.** — *The Journal of Agricultural Science*, Vol. IV, Part 2, pp. 133-144. Cambridge, October 1911 (issued Nov. 11). **249**

Great Britain

The writer finds silver-leaf very abundant on plums in Cambridgeshire. Inoculations on plum branches with the sporophores of *Stereum purpureum*, also with pure cultures of mycelium grown from spores, and with the spores themselves, resulted in the appearance of the disease, thus confirming Percival's and Pickering's work.

N. PATOUILLARD. **"Bud-rot" in the Cocoa-nut Palm in Ceylon** (1) (A propos de la maladie du cœur du Cocotier à Ceylan). — *Journal d'Agriculture Tropicale*, 11ème année, N° 124, pp. 315-316. Paris, 31 octobre 1911. **250**

Ceylon

It is well-known that the "heart-disease" of the Cocoa-nut Palm, otherwise called "bud-rot" or "heart-rot" is due, according to E. Smith, to the action of a bacterium, and according to Butler, to the action of a fungus of the genus *Pythium*. It has not yet been clearly determined how the parasite effects its entrance.

In a letter addressed from Ceylon to the Journal of Tropical Agriculture, M. P. des Grottes mentions the extreme sensitiveness to injury of the Cocoa-nut Palm. indeed so sensitive is it that the slightest prick or scratch to the tender parts of the plant may start the disease. First of all, a brownish mark appears round the wound, which gradually spreads till it reaches the centre of the bud itself, where all the young leaves are destroyed.

The appearance of "bud-rot" is connected with the Monsoon. At this period the rains and storms accompanying the wind give a new supply of sap to the Palms, whose vegetative parts are thereby rendered extremely fragile after a more or less prolonged season of drought. This atmospheric action not only affects the large palm-leaves which become more or less damaged, but also the smaller central ones, often breaking them off at the base. It is highly probable that these accidental injuries form one of the principal means of entrance to the cryptogamic germs which cause the disease.

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(1) See *Bull.* Dec. 1910, pp. 368-369; July 1911, No. 2163; and Aug-Sept.-Oct. 1911, No. 2692. (*Ed.*).

251 P. H. ROLFS. **The Diseases of the Avocado in Florida.** (The Avocado in Florida. Its Propagation, Cultivation and Marketing). — *The Florida Grower*, Vol. 5, No. 5, p. 3. Tampa, Florida, November 2, 1911.

United States: Florida

One of the most common diseases of the avocado (*Persea gratissima*) noted in Florida is due to a *Gloeosporium*, probably an undescribed species.

This almost invariably attacks the leaf at the tip, and gradually works back from this point into the blade. By the time that the leaf has become two-thirds or three-quarters diseased it usually falls off, and in this way the fungus may defoliate the entire tree. Remedy: — Spraying with Bordeaux mixture should be begun on the first appearance of the trouble. If spraying is delayed until the tree has been partially defoliated, success will be attained with much greater difficulty.

Apparently the same fungus which causes the disease of the leaves attacks the fruit in various stages of development. If the disease becomes prevalent while the fruit is small, it will shed off until the tree is quite fruitless. If the disease attacks the more mature fruit, it is liable to remain on the tree until nearly ripe, but the fungus produces a brown spot, and finally the skin cracks.

Remedy: — The same remedy should be used as for leaf fungus. (1).

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(1) Apparently the same disease of the Avocado is described by F. L. STEVENS and J. G. HALL (*Diseases of Economic Plants*, p. 184. New York, 1910) under the name Anthracnose (*Colletotrichum gloeosporioides*).

SEIYA ITO. **Gloeosporiose of the Japanese Persimmon.** — *The Botanical Magazine*, Vol. XXV, No. 296, pp. 197-201. Tokyo, September 1911. 252

The present study was undertaken with a view to elucidating the most serious disease of the kaki caused by a species of *Gloeosporium*. The loss due to this disease is often quite considerable. Badly affected trees have not produced even a single fruit during the past three years in the vicinity of Shirone.

Symptoms of the disease. The diseased spots may be observed when the fruit is not yet ripe. They appear first as very small, black specks, which gradually enlarge their area and finally often coalesce into very large, irregular shaped spots. On the older spots numerous small black pustules, slightly raised and arranged somewhat in concentric rings, begin to appear. These pustules soon break through the epidermis, discharging spore-masses. The majority of the affected fruits fall to the ground and turn yellowish brown in colour. The disease also attacks the ripe fruits in storage. Some growers in the province of Echigo informed the writer that similar symptoms sometimes appear on the young branches. **Japan**

The causal fungus was discovered and is described by the writer as *Gloeosporium Kaki* n. sp. It differs in many points from *G. Diospyri* Ell. et Ev. which is parasitic on the leaves of *Diospyros virginianus*.

Yoshino's *Gloeosporium* on the fruit is most probably identical with *G. Kaki*, but detailed accounts and descriptions of it have not yet been published. If the two species of *Gloeosporium* be the same, the distribution of the disease would be widespread, as could be inferred from the places of its collection, so widely distant as Higo and Echigo.

PARASITIC FLOWERING PLANTS. WEEDS AND OTHER INJURIOUS PLANTS

258 **Methods of Exterminating the Wild Morning Glory** ***(Convolvulus sepium*** **L.).** — *California Fruit Grower*, Vol. XLIV, No. 1219, pp. 3-4. San Francisco, November 18, 1911.

United States: California

The wild morning glory (*Convolvulus sepium* L.) (1) is one of the most troublesome weeds throughout California. The plant has a most injurious effect upon the crops. It often completely destroys young vines and trees and it will stunt old orchards and vineyards, and render them unprofitable. In the worst cases the growing of trees or crops has sometimes to be abandoned. The weed has unusually strong, far reaching roots, and the smallest piece of root is capable of growing and originating a new plant.

In the experiments of Professor Bioletti at the experiment farm at Davis, California, the only remedy which has been found effectual in exterminating the morning glory from a given area has been cultivation with a weed cutter every five days, from June 1st to the first of November, the knife going to a depth of about 3 inches. By running the knife deeper, say to a depth of 5 or 6 inches, Professor Bioletti thought that the time between cuttings could be lengthened and the number of cuttings diminished without any inferiority in the results. The cost of the entire treatment represented 9 dollars per acre.

Two other ways of dealing with the pest are given by Prof. C. W. Beers. The first method is to plow the ground to a depth of 10 to 12 in. and thoroughly pulverize it, extending the treatment 2 or 3 ft. beyond the infested area. After this to saturate the entire patch to a depth of at least 8in. with a salt brine (2 lbs of salt for each gallon of water), then covering the patch with straw to a depth of one foot, and finally wetting the entire mass with water. It is best to apply additional straw when the first has become rotted. It takes two years for the soil to recover from this treatment. Another method is to use distillate instead of salt, preparing the ground for the treatment in the same way and soaking it with water to the depth of a foot, a day or two before applying the distillate, then covering with a layer of straw or other suitable mulch. The ground can be used the year following the application of the distillate. Prof. Beers also recommends the cultivating method.

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(1) Known in England as Large Bindweed, and often a bad weed in gardens and bush fruit plantations, rarely troublesome in arable land. (*Ed*).

INSECT PESTS

GENERALITIES.

P. L. Guppy. **Insect Pests in Trinidad during 1910-1911.** (Insect Notes for the Year 1910-1911). — *Board of Agriculture, Trinidad-Circular* No. 3, pp. 1-14. Trinidad, 1911. **254**

The article under review gives a more extended account of life histories, habits, etc. of the insect pests referred to in *Circular No. 2* **Trinidad**
Notices are given of the following species.

Insect Pests of Cacao. Leaf-eating Beetles : two species of *Neobrotica*; *Colaspis* sp ; *Diabrotica* spp ; *Homophoeta* sp; *Disonycha* sp ; *Oedionychis* sp ; *Rutela lineola* ; *Brachyomus tuberculatus* ; *Ancistrosoma farinosum* (" Cacao chafer ") ; *Lachnosterma patens* (?)

Otiorhynchid beetles (Leaf-eating weevils) : *Pelidnota* sp.

" Podhoppers " (*Horiola arcuata* and allied species) which are protected by several species of ants; three useful egg-parasites, *Uscanella bicolor, Trichogrammatella tristis* and *Tumidifemur pulchrum* exercise a considerable control over the "podhoppers" wherever the latter are attended by ants that do not build their galleries over the eggs..

Longicorn Beetles : *Steirastoma depressum* (" cacao beetle "). *Trachyderes succinctus* and *Ecthoea quadricornis* (" twig-girdler " or " sawyer ') bite away circular grooves into the woody tissues.

A somewhat similar damage is done by *Endesmus grisescens*, *Macropus longimanus* ("harlequin beetle") and *Oncideres tesselatum*.

Mr. Urich has also called attention to the "Ambrosia beetles" or "shot borers" *viz*: *Xylelorus perforans* and *Plantypus* sp.

Rubber. So far Hevea is practically free from any serious pest. The caterpillar of a hawk moth (*Dilophonota Ello*) is occasionally found eating the leaves of the young plants; the same caterpillar was occasionally found feeding on cassava plants. A scale insect (*Aspidiotus ficus*) has been found on Hevea plants in other countries but not in Trinidad. Castilloa is attacked by the "Akee fringed scale" (*Asterolecanium pullulans* Ckll.) which sometimes kills, but mostly disfigures, the young trees, and retards their growth. This insect is common in Jamaica and fairly prevalent in Trinidad. Lime-sulphur solution (1 gal. to 15 or 20 gals. of water) was recommended. "Scalecide" (a proprietary insecticide manufactured by the B. G. Pratt Coy., New York) has proved to be very effective. *Diaspis amygdali* has not been found, up to the present, attacking Castilloa in Trinidad.

Tobacco "Tobacco Horn worm" (*Protoparce* (*Phlegethontius*) *sexta*), known in the United States as "Southern Horn Worm"; caterpillars of this species are also found on tomato and sometimes on pepper (*Capsicum*) plant.

The "Tobacco bud-worm" (*Chloridea virescens*) persistently attacks the plants at all stages of their growth. The common reddish-brown house-wasp is very active in controlling this pest; It would also remove "horn-worms". Arsenate of lead at varying strengths from 3 to 6 lbs to 50 gals of water sprayed on the young leaves at the top, and poisoned corn meal sprinkled in the bud have been successfully used in the fight against the bud-worms.

The "Tobacco Flea-Beetle" (*Epitrix* sp.) is well-known as one of the worst pests of the tobacco planter; it is also fond of tomato and egg-plants. As a preventive measure against this pest care should be taken to keep down all weeds, especially those of the potato family. Sprayings of arsenate of lead (8 to 10 lbs to 50 gals. water, in seed bed; 4 lbs. to 50 gals. water in the fields) are advised as control measures.

Grasshoppers occasionally cut away large pieces out of the leaves but they have not been troublesome. Wasps are always seen in numbers on tobacco plants; not only do they remove all sorts of worms but they attack young grasshoppers as well, so that they are friends of the planter.

Cotton. Cotton stainers (*Dysdercus Howardi* and *D. Howardi var. minor*) have been found on "gemauve" or "wild ochroe" (*Malachra capitata* L). This common bush-like shrub is preferred by stainers to wild cotton.

Miscellaneous. The caterpillar of *Hypsipyla grandella* has often been found tunnelling in young cedar. The damage to the trees is slight.

"Roble" and "Poni" are occasionally stripped of their leaves by the caterpillars of *Dasylophia guarana.* A parasitic fly (*Winthemia quadripustulata*) keeps the pest in check to a certain extent. The nymphs of the Giant Locust (*Tropidacris dux*) were observed attacking and badly disfiguring the palm *Livistona Jenkinsiana.*

The following table is a brief insect diary for the year 1910-1911.

Date	Popular name	Scientific name	Remarks
1910 March	Breadfruit Hopper.	*Aethalion* sp.	Very common on bread fruit trees, Princes Town.
do	Small Cacao Chafer Beetle.	*Ancistrosoma farinosum*	Rather numerous in Caura Valley- attacks cacao leaves.
April to June	Breadfruit Hopper.	*Aethalion* sp.	Still common in Princes Town.
May to December	Leaf-eating Beetles.	1. *Colaspis* sp 2. *Diabrotica* sp. 3. *Neobrotica* sp. 4. *Rutela lineola.* 5. *Brachyomus tuberculatus* and others mostly of the Chrysomelidae group.	Nos. 1 and 3 swarmed all over the Island., 2 rather local. Nos. 4 and 5 plentiful in Southern Division. Great damage done to young Cacao leaves. Towards December the beetles diminished in numbers considerably.
May	Large Cacao Chafer.	*Lachnosterna patens.*	Damage to cacao leaves. Local.
October	Mahogany and Cedar Borer.	*Hypsipyla grandella*	Causes deformity to young cedar and mahogany trees.
1911 January	Thrips.	*Heliothrips rubrocinctus.*	In dry weather Thrips become numerous.
do	Cacao Beetle.	*Steirastoma depressum.*	Beetle very active during dry weather, January to April especially.
do	Bucare flower caterpillar.	Pyralid Moth. (*Liopasia* sp.).	Plentiful when Buccare (1) Immortelle flowers. Sometimes mistaken for Cacao-beetle worm.

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(1) » Bucaré de Anauco en Caracas » = *Erythrina velutina* Willd.; « Bucaré de Caracas » = *E. umbrosa* H. B. et Kunth.; « Bucaré de Cuba » = *E. glauca* Willd. (MIGUEL COLMEIRO, *Diccionario de los diversos nombres vulgares de muchas plantas,* etc., p. 39. Madrid, 1871). (*Ed.*).

February	Tobacco Horn Worm. Tobacco Bud Worm.	*Phlegethontius sexta.* *Chloridea virescens.*	Numbers of eggs and worms found on tobacco plants early in February.
	Tobacco Flea beetle.	*Epitrix* sp	Small circular holes in leaves.
do	Cacao Podhoppers.	*Horiola arcuata* and other species	Plentiful in certain localities but kept in control by useful minute egg-parasites, except in certain localities where the parasites are absent, or where protected by paper nests of ants on pods
March	Cacao Podhopper.	*Horiola arcuata*	In certain localities the podhopper affects the growth of the young pods and means should be taken to keep it in control Propagated by ants that protect them. Ants must be destroyed

RESISTANT PLANTS

255 MOLDO MONTANARI. **On the Resistance of a Maize Variety to Locust Attacks.** (El Maiz amargo en el Campo Experimental de Agricultura de la Chacarita). — *Revista de la Asociación Rural del Uruguay.* Año XIV, N 10, pp. 776-778. Montevideo, Octobre de 1911.

Argentina

A variety of Maize called Bitter Maize, in the province of Entre Rios, Argentina, was presented at the Argentine Centenary Exhibition as proof against locusts. It further has the advantage of growing to exceptional size and giving a very high yield. The Author wished to verify the degree of justification for the claim made on behalf of the bitter variety as regards its being proof against locusts. For this purpose he had some locusts captured in the first or second stage of development and enclosed them in spaces shut off by metal gauze and grown with common Maize and Bitter Maize. He thus found that the locusts attack both the Bitter Maize and the other varieties until they have attained a height of 10 cm. When the Maize developed beyond this, the locusts directed their attacks by preference against the common varieties. Therefore the resistance of the Maize is relative. By careful and repeated selections it would certainly be possible to increase it until it becomes absolute. Nothing can as yet be said as to the cause of the resisting powers of Bitter Maize : it must be sought for in some peculiarity of anatomic structure or special chemical composition, or in anatomical structure and chemical composition combined.

MEANS OF PREVENTION AND CONTROL.

256

R. J. D. Graham. **A Note on the uses of *Cleistanthus collinus* in the Nagpur Division of the Central Provinces.** — *The Agricultural Journal of India,* Vol. VI, Part IV, pp. 424-425. Calcutta, October, 1911.

British India

Cleistanthus collinus Benth. et Hook. (syn. *Lebidieropsis orbicularis* Muell. Vern. « Garari ») is a small deciduous tree most commonly growing as coppice. The bark or outer crust of the capsule is exceedingly poisonous, and the fruit and bark are employed in Chota Nagpur and in the Balaghat district to poison fish. Another interesting use is made of this plant in the same district. When the rice crop is attacked by stem borer (1), it is the custom to throw the leaves on to the water in the rice land in order to prevent the spread of the insect.

With regard to the chemical nature of the poison, Greshoff mentions that there is hydrocyanic acid present (*Kew Bulletin,* 1910, 10, 403), while Dekker has separated from the bark tannin, saponin and a crystalline phytostearin (*Pharm. Weekblad,* 46, 16, 20).

257
Germany

Use of Pigs to destroy Harmful Forest Insects. — See above, No. 169.

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(1) *Schoenobius bipunctifer.* Cf.: *Agricult. Research Institute, Pusa. List of Names used in India for Common Insects, compiled in the Laboratory of the Imperial Entomologist, Bull.* No. 19, p. 11. Calcutta, Superintendent Government Printing, India, September, 1910. (*Ed.*).

258 **Insectivorous Birds of New South Wales** (1). — *Agricultural Gazette of New South Wales*, Vol. XXII, Part 7, pp. 611-612, 1 Pl. and part 10, pp. 842-843, 2 Pl. Sydney, July and October, 1911,

These two parts of this series contain the following species: Caterpillar eater (*Lalage tricolor* Swainson); Yellow-breasted Thickhead (*Pachycephala gutturalis* Latham); Laughing Jackass (*Dacelo gigas* Bodd.) and More-pork (*Podargus strigoides* Lath.).

Australia: N. S. Wales

Lalage tricolor is the most commonly seen species of Caterpillar eater. It is a strictly migratory bird in New South Wales. Its food consists entirely of insects and their larvae, obtained chiefly among the leaves of trees, and sometimes on the ground.

The Yellow-breasted Thickhead may be met with all the year round in the coastal and mountain districts of New South Wales.

The Laughing Jackass undoubtedly kills snakes for food and also eats beetles, rats, mice, centipedes and other vermin. There is no record of its ever touching grain or fruit. Mr. North found the contents of stomachs of the More-pork to include the remains of frogs, crickets and spiders, and the heads and wing cases of large beetles. Mr. Hall has observed that the birds devour centipedes, tarantulas, crustaceans, and many hard-winged insects, and states that they are excellent destroyers of garden vermin, slugs in particular.

Mr. W. W. Froggatt has fed tame ones on mice, which they would take alive at one gulp. This should be quite sufficient to show their value to agriculture.

259 **The Short-Eared Owl (*Asio accipitrinus* Pallas)** — *Board of Agriculture and Fisheries, Leaflet*, No. 42, pp. 4. London, August 1897, revised November 1911.

Great Britain

The Short-Eared Owl (*Asio accipitrinus*, Pallas, *Otus brachyotus*, *Strix brachyotus*) differs somewhat in its habits from other owls found in Great Britain, which live in thick woods and plantations, or in barns, churches, and ruins, and seldom leave their retreats during the day. The haunts of the Short-Eared Owl are heath and moorland, marshes, furzy downs, meadows, turnip fields and open places, principally in the north of England and Scotland, though it is found occasionally in many English counties. It flies in the day-time as well as at night. Its food consists of mice, voles, rats, small birds, fish, reptiles, large insects, and occasionally bats.

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(1) The previous parts of this series have been reviewed in our *Bulletins* as follows: May 1911, No. 1571; July 1911, No. 2337; Aug.-Sept.-Oct. 1911, No. 3035. *(Ed.)*.

This species is found almost all over the world. In the British Islands it is chiefly a winter visitor, but it occasionally stays to breed, especially in districts where there has been an extraordinary supply of its favourite food —mice, voles or rats In Gloucestershire, for example, when there was a great plague of mice in the Forest of Dean, Short-Eared Owls were attracted there in large numbers and materially assisted in destroying the intruders The birds also proved markedly useful during the last severe plague of voles in the south of Scotland.

The Short-Eared Owl is much appreciated in Germany, where it is called the Moor, Fen or Meadow-Owl It occasionally breeds in Germany as in England, while it also breeds, but not extensively, in certain Southern Departments of France.

260

F. H. CHITTENDEN and C H. POPENHOE. **Carbon Tetrachloride as Substitute for Carbon Bisulphide in Fumigation against Insects.** — *U. S. Dptm. of Agr, Bur. of Entomology, Bull.* No. 96, Part IV, pp. 53-57. Washington, October 12, 1911

United States

These are records of experiments made with carbon tetrachloride as a fumigant for nursery trees in 1908 (Dr. W. E. Britton, *Journ. Econ. Ent.*, vol. I, p 111, 1908), but tests for stored products were made more recently (Prof. Albert P. Morse, *Journ. Econ Ent*, vol. 3, p. 104, 1910). A detailed series of tests of the insecticidal properties of this chemical has been made by the writers at Washington, D. C., and at Baltimore, Md The treatment with carbon tetrachloride was tried against the following insect pests of stored grains: Saw toothed grain beetle (*Silvanus surinamensis* L); *Laemophloeus minutus* Oliv., the confused grain beetle (*Tribolium confusum* Duv.); the rust-red flour beetle (*T. navale* Fab.); *Calandra oryza* L., *C. granaria* L.; the cadelle (*Tenebroides mauritanicus* L.); the Indian-meal moth (*Plodia interpunctella* Hubn.); the Mediterranean flour moth (*Ephestia Kuehniella* Zell.); the fig moth (*E. cautella* Walk.); the four spotted bean weevil (*Pachymerus quadrimaculatus* Fab.); *Caenocorse Ratzeburgi* Wissm. and *Laemophloeus minutus* Oliv.

The conclusions arrived at from the writers' experiments are as follows: For practical purposes carbon tetrachloride at the rate of 28 cents a pound costs fully three or four times as much as carbon bisulphide and, in the case of purchase at retail drug stores, probably on an average two or three times as much.

Considering the strength at which it is to be used (10 lb.. to 1 000 cubic feet), it is very obvious that this chemical, unless it can be manufactured at a much lower price, can not be as economically employed as a remedy for insects injurious to stored products in warehouses, mills, etc., but might be used for choice seeds or in office rooms and dwellings, which can be very tightly closed and where the use of inflammable materials is undesirable.

261 **Spraying for Codling Moth.** — *Farmers' Advocate* Vol. 46, No. 996, p. 1746. London, Ontario, October 26, 1911.

Canada

In the spring of 1911 a very warm spell swept over Western Ontario just when the petals of the apple blossoms were about to fall. This hastened the falling which was closely followed by the closing up of the calyces. The closing of the calyces protected the eggs and larvae of the codling moth (*Carpocapsa pomonella*) against insecticides applied afterwards. Since spraying during full bloom injures the blossoms, the sprayng must be delayed until the petals are about to fall. This year, owing to the shortness of the period between the falling of the petals and the closing of the calyces many orchards that were sprayed for codling moth bore wormy apples. The author sprayed one orchard on May 24th, 25th and 26th and another orchard on May 27th. The former bore fruit fairly free from codling moth while fruit borne by the latter orchard was badly infested. Reference is made to a similar experience in the orchard at the Ontario Agricultural College.

INSECTS AND OTHER INVERTEBRATES INJURIOUS TO VARIOUS CROPS.

262 T. Bainbridge Fletcher. **The Rice Weevil in India.** (Weevil and Dry Wheat). — *The Agricultural Journal of India*, **Vol. VI**, Part IV, pp. 333-343. Calcutta, October, 1911.

British India

An insect that does an immense amount of harm in India is the common Rice Weevil (*Calandra Oryzae*) found not only in wheat but in " juar ", maize, rice and, indeed, in all stored cereals and peas, though best known in rice. It also feeds on ground cereals although it is not responsible for the repulsive taste communicated to flour by other minute beetles (*Tribolium*) often found in the flour also. Rice and wheat in the ear are not, or only very slightly, attacked, but barley in the ear is as much subject to attack as when husked.

In one experiment carried out in the Pusa Insectary it was found that roughly one third of wheat grains, which had been put into a box with a large number of wheat weevils and left, had been totally destroyed in less than 6 months. Some 20 years ago a leading firm of grain merchauts estimated the annual loss due to these weevils to be 10 % in the year.

The Rice Weevil has been carried all over the world with shipping; its original home, however, was probably in the warmer rice-growing districts of Southern and Eastern Asia. It is abundant everywhere in India, Burma and Ceylon.

In colder climates it is said that this beetle has only one generation in the year, but in the warmer parts of India it is probable that there are about 8 broods annually, whilst in districts with an appreciable amount of cold weather there may be only 4 or 5 generations in the year The life history of this weevil is accomplished inside a single grain, which furnishes it at the same time with food and shelter. The mother-weevil gnaws a small hole into a wheat grain and thrusts the egg into this hole. In many cases, however, the eggs are simply deposited loosely amongst the grains or stuck to the outer surface The eggs hatch as a rule on the 4th day after they have been laid. On hatching out, the young larva bores into the interior of the grain in or on which the egg was originally laid and consumes the starchy substance of the interior, passing its whole larval and pupal life inside this one grain. No hole is prepared for the emergence of the beetle, which gnaws its own way ont. The adult beetle gnaws into grains and feeds on their contents. and it seems probable that the destruction wrought by the beetle after attaining maturity is greater than that done before it has attained this condition.

During its larval life the Rice Weevil is extensively parasitized by *Pteromalus Oryzae* (Hymenoptera).

Fumigation with carbon bisulphide at the rate of about 1 ½ lbs. to the ton of grain, and drying the grain are advised as means of control. Bottle experiments carried out at Pusa during 1909 indicate that wheat will not be attacked by weevils under certain conditions of dryness. Wheat when threshed contains aboot 8 % of moisture, which may be reduced to about 4 % by exposure to the sun in April-May. Whilst containing less than 8 %, stored wheat is immune from attack by weevil, and any weevils which may obtain access to it are soon killed off. If stored in insect-proof receptacles wheat which is already free from weevil will be preserved from attack.

The article under review is illustrated by a coloured plate of 9 figures.

263
British India

Insect Pests of Sesamum. See above, No. 229.

264
Australia: N. S. Wales

WALTER W. FROGGATT. **The Wild Passion-fruit Weevil (*Oemethylus quedrengularis* Lea).** — *Agricultural Gazette of New South Wales*, Vol. XXII, Part 10, pp. 910-911, 1 Pl. Sydney, October 3, 1911.

This weevil has been found infesting the fruits of the wild passion-vine (*Passiflora Herbertiana*) over a very large area Its range is probably that of its food plant which grows throughout the semi-tropical scrubs. The fruit is punctured and scarred by the adult weevil ovipositing in the skin of every fruit from the smallest to the full-grown specimens. Mr. Horace Brown has bred another species from the fruits of wild passion-fruits on the Northern Rivers. The writer suggests that in the event of this beetle attacking cultivated passion-fruit (1), it could be kept in check by gathering the infested fruits or destroying the wild passion-vines. Descriptions and drawings of adults and of larvae are given.

265
France

Insects injuricus to Chrysanthemums in France. - See above, No. 224.

266
Algeria

Enemies of Vines in Algeria. - See above, No 134.

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(1) *Passiflora quadrangularis* ("granadilla" or "parcha") widely grown in the Tropics, *Passiflora laurifolia* ("Jamaica honeysuckle" or "Water lemon") cultivated in the West Indies; *Passiflora edulis* indigenous in Brazil and naturalized in Tropical countries; *Passiflora curumbaensis* indigenous in Ecuador, etc (H. SEMMLER, *Die tropische Agrikultur*, IV Bd., pp. 261-262, Wismar, 1892, and L. H. BAILEY, *Cyclopedia of American Horticulture*, Vol. III, pp. 1219-1221 New York, 1907). (*Ed.*).

F. W. Urich. **Ants of Cacao Estates.** — *Board of Agriculture Trinidad, Circular No. 3*, pp. 15-18. Trinidad, 1911. **267**

West Indies: Trinidad

Injurious Ants. Since Mr. E. André published his paper on « Black rot of the cacao pod » in 1906, ants in their relations to cacao disease and cacao insects have attracted attention; Mr. Barret (*Cacao Pests of Trinidad, Proc Agr. Soc of Trinidad*, Vol. VII pp. 288-290) refers to them in connection with the dispersion of fungus spores and the writer has made observations in regard to the relations of ants to sucking insects.

A very large proportion of the ants of the Tropics live on trees, so that it is natural that being deprived of forest trees in connection with the formation of estates, they have adapted themselves to cacao trees and continued their cult of protecting and encouraging honeydew secreting insects of all kinds. In this connection two genera of ants stand out prominently; they are *Azteca* (« Balata ants ») and *Dolichoderus* (« Stinking ants »).

Of the 6 species of *Azteca* found about cacao estates, *Azteca chartifex* appears to be the most injurious species. Trees on which these ants are well established never seem to grow well and the pods they produce are often dwarfed and few in number. Like all members of the family they cultivate all kinds of Homopterous insects, which in their turn suck the juices from the pods and stems and by the stimulation of the ants take far more liquid out of the plant than they would otherwise. The following insects have been found associated with this species of *Azteca: Horiola arcuata* and allied species, *Dactylopius Citri* and *Lecanium nipae*. Colonies of these insects are protected by coverings made of a carton consisting of earth and minute particles of wood. *Azteca velox* cultivates honeydew secreting insects but does not build any protecting covering over them. *Azteca bicolor* makes its nest in any rotten part of a tree, often it is to be found in the immortelle shade trees. It is not as common as the two other species.

The Dolichoderi or stinking ants are not as numerous and although they foster a greater variety of insects than the last species, they do not build coverings over them, and thus allow the natural enemies to have a look in. The writer has noticed them nursing Lycaenid, and *Nyphidium* caterpillars, while *Azteca* does not.

Of the genus *Pheidole* only *P. biconstricta* occurs in any number and does some harm. This species is more numerous in recently formed cacao estates and seems to disappear after a while. In the forests, especially those of the Northern Range, it is very common.

The species of *Crematogaster*, or shining ants, are not numerous and do not appear to frequent cacao estates much. They are more to be found on guava, sapodilla and citrus trees. They form their nests under the loose bark of trees and are fond of scale insects living on these situations, like *Icerya Rosae* and *Lecanium Urichii*. They also frequent scales found on the leaves and twigs of plants.

Species of *Solenopsis*, or stinging ants as they are called locally, do not occur numerously on estates. They are more to be found in vegetable and other gardens Their nests are made in the ground, often at the roots of trees. They encourage scale insects to a great extent and are especially devoted to root inhabiting species.

Cryptocerus is not a species to be feared much. The writer has seen it eating fruit. It gathers honey dew in a less degree than the others and makes its nest in hollow parts of trees.

Beneficial Ants. All species of *Eciton* or hunting ants frequent cacao estates and do a great deal of good in destroying all kinds of insects. *Odontomachus haematodes* or " tack tack " ant, is not a bad ant as it is carnivorous, as is also *Anochetus emarginatus*, the smaller brown " tack tack ", which makes its nest in hollow parts of trees.

Quite a number of small species of *Monomorium*, *Tapinoma*, *Pseudomyrma* and *Camponotus* inhabit dry pods and hollow twigs, but they can hardly be called injurious.

Methods of Control. Carbon bisulphide is a good insecticide for most ants' nests in ground. For nests at the roots it is better to use cyanide of potassium (1 oz. to a gallon water). In connection with tree-inhabiting species, kerosene emulsion in 10 per cent. or 15 per cent solutions seems to answer very well for the Aztecae. Stinking ants and the Cryptoceri will take stronger solutions. Before spraying, the carton nests should be broken up.

A preliminary list of Trinidad ants, including 69 species, is appended.

968 F. H. CHITTENDEN and E. G. SMYTH. **The Fig Moth (*Ephestia cautella* Walk.).** — *U. S. Dept. Agr. Bur. Entom. Bull.* No. 104, pp. 65. Washington, November 4, 1911.

United States. Turkey-in-Asia

Mr. E. G. Smyth visited Smyrna in Asia Minor to investigate the local conditions under which the fig industry is carried on, and his report is embodied in the second part of this bulletin. The work upon which the first part is based was conducted by Dr. Chittenden, and this portion of the bulletin gives a very full general account of the Fig-Moth. The life history and food habits of the fig moth, as it occurs in the District of Columbia, where the weather in midsummer is not materially cooler than in Smyrna, have been thoroughly worked out, while the recommendations as to remedies are based upon actual experiments.

Prominent among the many species of insects which are being constantly shipped to the United States from abroad is the fig moth (*Ephestia cautella* Walk. syn. *E. cahiritella* Zell., *E. passulella* Barr. and *E. desuetella* Walk). Since 1908 this species has attracted much attention by its occurrence in various edibles in different portions of the United States, as well as in the mills of Texas and Louisiana.

A very large portion of imported figs, especially such as are shipped from Smyrna, which port ships about 90 per cent of its total output to the United States, is found to be badly infested when reaching America. The dried figs in the market are frequently found to contain from 15 to 50 per cent and even higher percentages of infested fruit.

The fig moth is supposed to be of Asiatic origin ; it is, however, very widely distributed, the known distribution including Ceylon; Egypt; Smyrna, Turkey-in-Asia ; China; Cochin China; Japan; Siberia ; England ; south-central and southern Europe Venezuela ; Guayaquil, Ecuador; Jamaica and Trinidad, British West Indies. In North America it is known in the following localities: Montreal, Canada; Milton, Mass. ; New York, N. Y.; Washington, D. C. ; Milwaukee, Wis., Calla, Ohio ; Hershey, Pa.; Guthrie, Okla.; Wichita, Kans. ; Miami, Fla. ; New Orleans, Morse and Lake Arthur, La. ; Galveston, Dallas, Sherman, San Antonio, New Braunfels, Fort Worth, Wichita Falls, Beaumont, Houston, Mc Kinney, and El Campo, Tex.

The following is a list of the observed food materials of the fig moth: — Cacao beans (*Theobroma cacao*); prepared chocolate; tonka beans (*Dipterix odorata*); walnuts (*Juglans regia*); pecans; peanuts (*Arachis hypogaea*); figs; chick-pea (*Cicer airetinum*); wheat flour ; rice and rice preparations and bran; Indian corn and corn meal and other preparations ; hominy; oatmeal ; cotton seed and meal and cotton-oil cakes; asparagus berries; evaporated and dried apples; linseed or flaxseed meal; Corinthian currants (*Vitis corinthiacea*); the seeds of *Zizyphus Jujuba;* the fruit of *Cecropia palmata;* « locust beans » of commerce ; wild gallnuts; and dried insects. It seems that it is as an enemy of stored rice and of cacao beans that this species is most entitled to serious consideration. Two species of parasites, *Hadrobacon hebetor* Say, and *Omorga frumentaria* Rond., have been observed by the writer, in addition to a mite (*Pediculoides ventricosus* Newp.) preying upon this moth. Undoubtedly it has many other natural enemies.

Fumigations with hydrocyanic acid gas or with bisulphide of carbon are advised as methods for controlling the fig moth. A special recommendation is the treatment of figs in specially prepared fumigatories located a short distance from the « khans » or buildings in which the figs are stored. It has been found that bisulphide of carbon at a high temperature, ranging between 90°F. and 100° F. will kill practically all fig moths with an exposure of 24 hours, even with less of the fumigant than is usually advised.

There are four preventive measures to be observed: 1) The rapid disposal or destruction of the June crop of figs; 2) the covering of the figs at night while on the « serghi » (beds of reeds or other suitable plants laid upon the ground to protect figs from contact with the soil while drying); 3) the screening of the fig « depots » in the interior; 4) the prompt delivery of the figs to the « khans » after they are gathered. Of the three methods mentioned for destroying the fig-moth larvae in the « khans » — by steam, hot water, or dry heat — it remains for the packers to demonstrate by actual experience which is the most practicable.

The paper is illustrated by 16 plates and 4 text figures. A bibliographical list of 18 papers is appended.

269 DUDLEY MOULTON. **The California Peach Borer.** — *U. S. Dept. of Agr., Bur. of Entomology, Bull.* No. 97, Part IV, pp. 85-89, fig. 22. Pl. VIII-X. Washington, October 17, 1911.

United States

The California peach borer (*Sanninoidea opalescens* Hy. Edw.) has been a menace to fruit growers in the Santa Clara Valley, California, from the very beginning of the fruit growing industry. It is in close relationship to the peach borer of the East (*Sanninoidea exitiosa* Say). The writer can not understand why an insect which is so widely distributed throughout the western coast States should be so local in its injury in cultivated orchards.

The Santa Clara Valley, the area on either side of San Francisco Bay in Alameda and San Matteo Counties, and small areas near Watsonville, Santa Clara County, are the only places where the « peach borer » has become a pest. The western chokecherry (*Cerasus demissa*) which is indigenous to the Sierra Nevada Mountains, middle North Coast Range (Napa Mountains), Oakland Hills, Mount Hamilton Range, and the Santa Cruz Mountains, is undoubtedly one of the common native food plants of this insect. Beginning about 1880 the lower foothills and the upper western areas of the Santa Clara Valley were gradually cleared and planted to orchards. Thus the cultivated varieties displaced some of the insect's native food plants in its native habitat and the insect adapted itself to those cultivated plants which were closely related to the native varieties and extended its habitat into the open and adjoining country. The « peach borer » is eminently a root-boring pest, so that the kind of root stocks upon which the trees are growing and the nature of the soil determine largely the amount of damage that the borers will inflict. Peach and apricot stocks are most susceptible to attack, while almond, cherry, apple and native plums are less so; and the wild plum known as the Myrobalan or cherry plum (*Prunus cerasifera*) is almost entirely exempt. Myrobalan plum seedlings are imported in great quantities from Europe, and they are now recognized as one of the best stocks upon which to graft domestic plums. Almond stocks are more or less resistant if planted in soils suitable to their growth.

Borers appear to attack trees more readily when they are planted in soils of a light sandy or gravelly texture.

The life habits of the California peach borer may be summed up as follows:—Adult moths are flying from June up to and including September, and are present in maximum numbers during July and August As they lay their eggs immediately after emerging, the period of oviposition conforms with that of the flight of the moths.

The egg stage lasts about two weeks, so that the period when the newly hatched larvae are entering the tree is about from the middle of June to the middle of October. The period when they are entering in maximum numbers is from the middle of July to the middle of September. Any repellent or protective wash, therefore, should be applied before the middle of June. Worming should be practiced during the winter or early spring months. Only dead bark should be cut away. The most effective wash that can be used in conjunction with the worming method is the lime-crude-oil (50 lbs rock-lime; 10 or 15 gals. water; 6 to 8 gals. heavy crude oil; add enough water to make the whole a heavy paste). Heavy crude oil is thought to be repellent to the borer moth and acts to draw many of the worms out, but is extremely injurious to some trees. It is apparently safe when combined with lime. Such preparations as residuum oil, gas tar or asphaltum can be applied directly to the bark of the tree with only a little danger, but common practice has demonstrated that a combination with lime is almost as efficient as, and far safer than, the crude oil alone.

The paper under review is illustrated by three plates and a text figure. A bibliography of 21 papers is appended.

INJURIOUS VERTEBRATES

270 F. W. URICH. **Rats and Other Mammals on Cacao Estates.**—*Board of Agriculture Trinidad, Circular* No. 3, pp. 19-22. Trinidad 1911.

W. Indies: Trinidad

There are in certain parts of Trinidad, especially in the Northern Range, numerous complaints about rats and the damage they do to cacao.

In Tobago they are also a great nuisance. Rats attack pods in all stages of growth and eat everything, skin and beans. Squirrels on the other hand choose only ripe pods and only eat the sweet covering of the beans, leaving these intact, and dropping them on the ground. « Manicou gros yeux » (*Philander trinitatis*) and allied species are accused of eating young pods ; but in laboratory observations it was not possible to induce this species to eat cacao pods in any stage. A list of the rats, squirrels and manicous of Trinidad, with remarks as to the localities where they occur and their habits, is appended.

It includes · — Rats: *Nectomys palmipes, Rhipidomys couesi, Oryzomys Trinitatis, O. speciosus, O velutinus, O. delicatus, O. brevicauda, Akodon Urichi, A. frustrator, Mus rattus, M. alexandrinus, M. musculus, Heteromys anomalus* (Grey Pouched Rat), *Loncheres Guianae* (Spiny Rat), *Echimys Trinitatis* (Pilori Rat). Squirrel: *Sciurus aestuans, S. Hoffmanni* (the only species recorded from Trinidad); " Manicou gros yeux ,, . *Didelphis Kartinophaga* (Common Manicou), *Philander Trinitatis, Marmosa murina, Thylamis carri* (1).

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(1) Full descriptions will be found in *Bulletin of the American Museum* Vol. V. pp. 203-234 & Vol. IX, pp 13-30 (*Author's note*).

With the exception of *Mus alexandrinus*, the only Tobago rat that the writer has seen is *Loncheres Guianae;* it is sure, however, that other species exist but they have never been collected and studied.

Trapping and poisoning by means of Strichnia sulphate (involving no danger for other animals) are advised as methods of control. The largest species of owls and snakes are the chief natural enemies of rats. *Corallus Cookei, Epicrates cenchris, Scytale coronatum, Coluber corais* ("cribo") and *Coluber variabilis* ("tigre") are non-venomous, rat-eating snakes and they should be protected.

Poisoning Sparrows. *Agricultural Gazette of New South Wales*, Vol. XXII, Part 10, p. 841. Sydney, October 3, 1911. **271**

Australia: N. S. Wales

Wheat powdered with diluted strychnine or soaked in a moderately strong solution of phosphorus poison, and sown broadcast over a newly sown crop, is advised as an efficient method of poisoning sparrows. Both methods are most effective in the early part of the wheat season.

INTERNATIONAL INSTITUTE OF AGRICULTURE

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THE INTERNATIONAL INSTITUTE OF AGRICULTURE

The International Institute of Agriculture was established under the International Treaty of June 7th, 1905, which was ratified by 40 Governments Ten other Governments have since adhered to the Institute.

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The Institute, confining its operations within an international sphere, shall:

a) Collect, study, and publish as promptly as possible statistical, technical, or economic information concerning farming, vegetable and animal products, the commerce in agricultural products, and the prices prevailing in the various markets;

b) Communicate to parties interested, also as promptly as possible, the above information;

c) Indicate the wages paid for farm work;

d) Make known the new diseases of plants which may appear in any part of the world, showing the territories infected, the progress of the diseases, and, if possible, the remedies which are effective;

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The Institute publishes: *a*) a Bulletin of Agricultural Statistics; *b*) a Bulletin of Agricultural Intelligence and Diseases of

Plants; *c*) a Bulletin of Economic and Social Intelligence; *d*) a Bulletin Bibliographique hebdomadaire (published every Saturday).

It has also published a volume on "The Organization of Agricultural Statistical Services in the Several Countries", and a volume on "Statistics of Cultivated Areas and of Vegetable and Animal Production in the Adhering Countries" (an Inventory drawn up from documents published by Governments), and "Monographs on Agricultural Association in Various Countries (2. Vol)".

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The information contained in some of the abstracts dealing with Canada has been most kindly placed at the disposal of the Institute by the Government of the Dominion.

The Canadian abstracting is by Mr. J. K. Doherty, the able chief of the Canadian Bureau of Correspondence with the International Institute of Agriculture.

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AGRICULTURAL INTELLIGENCE

NB. The Intelligence contained in the present Bulletin has been taken clusively from the books, periodicals, bulletins, and other publications ich have reached the Library of the International Institute of Agriculture Rome during the months of December 1911 and January 1912.

The Bureau assumes no responsibility with regard to the opinions and e results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES DEALING WITH AGRICULTURE AND INDUSTRIES DEPENDENT ON IT.

272 **Steps Taken by the Swiss Federal Council to Improve the Breeding of Small Live-Stock.** (Arrêté du Conseil fédéral suisse allouant des subsides pour l'amélioration de l'élevage du petit bétail (du 21 Mars 1911). — *Circulaire du Départem nt fédéral de l'Agriculture* (du 3 Avril 1911).

Switzerland

The Swiss Federal Council being of opinion that the breeding of small live-stock might, by means of well-organised and properly managed associations, be as rapidly and as generally improved as was the breeding of horned stock, has, by Decree of the 21st March 1911, fixed grants towards the foundation and annual prizes to Associations for pig and goat breeding, on the following conditions:

1. That the Associations desirous of receiving such grant shall be recorded in the Commercial Register.
2. That they shall possess breeding males which have received lst class awards, and at least one dozen sows or she-goats likewise having received lst class awards and marked with distinctive signs.
3. Furthermore, the Associations must undertake to keep, in a correct way, the Herd and Flock Books prescribed by the Federal Department of Agriculture.

273 POGSON, G. A. (Brit. consul at Parà). **Law for Encouragement of Rubber Cultivation in Parà.** — *The Board of Trade Journal,* No. 787, pp. 661-662. London, December 28, 1911.

In the State of Para a law provides for the grant of concessions to national and foreign companies registered in the State for the cultivation of rubber (*Hevea Brasiliensis*), cacao, nuts, etc.
Brazil The privileges offered include grants of public land up to 200 000 hectares (about 494 000 acres); reduction by 50 per cent. of the export duties and State dues upon the rubber, etc. produced, during the first ten years from the date of the first shipment, decreasing by 10 per cent. for each decade up to fifty years; reduction of State railway rates and of the freight charges of steamship lines subventioned by the State; waiving for ten years of the industrial and professional State and Municipal imposts upon the company's premises.

The concessionaire companies will be obliged, among other things, to plant not less than 50 000 rubber trees during the first five years of the concession, and 20 000 trees annually after that period; to comply as regards their produce, with the instructions of the Department of Agriculture; and to concede to the Government the supervision of the whole activity of the companies. In case of failure to plant a minimum of 50 000 rubber trees within the first five years, the concession will become void. The State Government will try to obtain from the Federal Government, on behalf of the concessionaires, a suspension of taxation as regards the importation of machinery and anything else required for the preparation and cultivation of the soil.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

274 HADDON SMITH, G. B. **Agriculture in Sierra Leone in 1910 and at the Government Farm of Konnoh.** — *Colonial Reports-Annual. Sierra Leone Report for 1910,* No. 694, London 1911.

The most marked feature in the agriculture of Sierra Leone in
ra Leone 1910 was the great scarcity of rice due to the early rains in 1909, the result being that many of the farms could neither be "burnt" nor cultivated. Rice has been the staple food of all the aboriginal

tribes in the Protectorate, from time immemorial, and no attempt appears to have been made, prior to 1910 to grow in sufficient quantity, any other food-stuffs to replace the rice crop in the event of the latter's failure. Ground-nuts, maize, bananas, sweet potatoes, and cassava had been grown merely as supplementary foods

Only in the lower river districts, where rice is grown on the land after it has been flooded, is the Japanese method adopted of sowing the original crop in seed-beds and then transplanting when the water goes down. In the higher districts there are from 15 to 20 different varieties of rice grown, most of which are mere hybrid off-shoots caused by the careless mixing of various kinds of seeds. One variety is ready for reaping within three months from the time of sowing, but the yield is low, about 15 bushels of husk rice per acre. Between seed-time and harvest of the other varieties about five months elapse, the average crop yielding per acre from 30 to 40 bushels of husk rice.

Native farming methods are primitive in the extreme. Old bush is cut down and burnt, no effort being made to remove the stumps, which remain to encumber the ground. The soil is then merely scratched with a piece of wood or some such simple implement; the seed is sown on the roughened ground, and the rest left to nature.

In order to meet the necessities of the growing population, experiments are being carried out by the Government with the object of improving if possible, the native methods of agriculture. The most important of these is the Government farm in the Konnoh sub-district. Definite information has already been obtained at the Government farm in ascertaining the extent of the advantage which crops grown on cleared and deep-hoed land possess over those which are the result of ordinary native methods; the relative yield of different varieties of native grown rice; the ratio of husk rice to clean rice for different varieties

An important problem now under study at the Government farm is the possibility of obtaining an economic rotation of crops, which will enable the same land to continue to be used instead of allowing it to revert to bush for four or five years, as is the native custom.

A definite solution of the problem has not yet been obtained, but it is hoped that the following rotation will prove successful:

1. Rice.
2. Ground-nuts.
3. Maize.
4. Pigeon peas (one to two years).

The greatest difficulty to be contended with is the inherent conservatism of the aboriginal, and his present disinclination to clear the ground of stumps, and to adopt a system of deeper tillage. Attempts are being made to introduce cacao into the Protectorate. This crop has been grown with a moderate degree of success by the people of the Colony, but no attempt has been made by them to cultivate it on scientific lines.

The imported varieties of maize do not seem to thrive; but in the Kuranko and Konnoh countries there is a peculiar local variety which is prolific, bearing six cobs to every plant. The seed is very small, but the cob is long and the outer " enamel " of the grain is so hard that it has the reputation of being almost impervious to weevils.

Ground-nuts, sweet potatoes and cassava grow everywhere. Yams have been imported from Southern Nigeria and are thriving.

English vegetable seeds were imported during the year and distributed to farmers in the Colony with a view to fostering a trade in market garden produce with Freetown.

During 1910 a Forestry Officer was appointed to organise a Forestry Department, and during the year an inspection was made of the various forests in the Colony and Protectorate. The forests of the mountains form the most important of the forests of Sierra Leone.

The dangers attending the destruction of the mountain forests are more serious than these which accompany the demolition of the woods of the plains. The conversion in this case is no longer one from wood-land to grass-land, but from wood-land to bare rock; the destruction of the mountain forests is widely affecting both the water supply and the general climate of the country. If the present rate of conversion from wood-land to grass-land is maintained, the retention of the present native method of agriculture would soon be out of the question. This matter therefore is engaging the serious attention of the Government.

275 DEBRAND. **The Koudou-Djouah Country, French Congo.** (Le Pays Koudou-Djouah). — *La Géographie*, No. 5, pp. 287-296. Paris, 15 Nov. 1911.

French Congo

The general appearance of the Koudou-Djouah country is at first sight that of a country not yet fully formed, in spite of the intense erosive action for centuries. There are often encountered large basins without any outflow, where huge marshes are formed with no other communication with the adjoining valley than a thin streamlet of water during the rainy season. These are the " potopoto ". The rivers exhibit very pronounced curves, often at an acute angle. Stones are very rare; clay predominates everywhere. During the two rainy seasons the rain is constant, and during the two dry seasons, especially the lengthier one, rain is frequent.

The tsetse fly abounds.

Throughout the region the equatorial forest extends. Sometimes it is the dense overgrown and impenetrable forest; then again it is only bamboo and rattan, particularly on the marshes. Sometimes, mainly on uplands with ferruginous soil, it is a thinner forest, in which only large trees grow. Finally, there is, particularly in the Djouah, a forest without any large trees, with dense vegetation, where shrubs 6 to 12 feet in height predominate. This is the " Rubia " forest with a rich, fertile soil. The power of vegetation is considerable, and every place cleared of shrubs and brushwood requires careful maintenance.

The most interesting plants, which may prove sources of revenue, are the " iraic " (ireek) yielding an excellent rubber; the rubber liana, kapok, kola; the " koumé ", with hard, light red wood, the " dougo-dougo ", a light wood for paper manufacture; the " gola " which yields an antiseptic powder rich in tannin; the " loko ", the " eguin " and the " leouakab " trees with medicinal properties; the " biese " and the " co ", exceedingly hard woods. Ebony is rare.

Fruit trees occurring are banana, papaw, mangrove, and guava. There is little grass. European vegetables thrive.

Elephants are very numerous. Oxen, antelopes, boars and panthers abound. Gorillas and chimpanzees are very often met with

The rivers are very rich in fish: carp and electric fish are present in multitudes.

Rubber abounds everywhere. A few small rubber plantations have been made, particularly at Soufflay, but they cannot yield any great results. It would be interesting to create schools to show the natives how the forest should be organised and managed, and how rubber should be harvested and prepared. Tobacco is excellent and may easily become an export article, as likewise castor-oil. The fruit of the rafia yields palm oil. The kola nuts and vanilla may be exported without great expense. Coffee grows wild Rice, millet, maize, sweet potatoes, the common potato and vegetables may very rapidly improve the life of the natives.

Ivory is a source of considerable revenue.

Animals' skins are at present wasted for want of buyers.

276 **Agricultural Prospecting in the Belgian Congo.** (Prospection agricole au Congo Belge). — *Bull. agricole du Congo Belge*, Vol. II; No. 4, pp. 600-617 (figs. + 1 plate). Bruxelles, Décembre 1911.

Belgian Congo

The General Direction of Agriculture of the Ministry of Colonies during the financial year 1910-11, organised, in the Belgian Congo, four missions having for their object to prospect for and study lands adapted for cultivation or breeding, and the examination of various questions in relation to agriculture, such as native crops, labour, flora, fauna, climate, etc.

The first mission was under the charge of M. Egger, who visited that part of the Lower Congo which is comprised between the rivers Inkisi, Congo and Kwilu and the Portuguese frontier. This region is generally broken in character and wanting in fertility.

In the valleys of the Lukunga and the Kwilu-Madiata, fine plains and large plateaus are found, which seem to offer good prospects for the successful raising of small and large cattle, but in the former of these valleys labour is scarce.

In the valley of the Loango, fertile arable lands are found, exceedingly well adapted for investment plantations, but the tsetse fly infests the region in large numbers, and furthermore the estates established in these districts would be too remote from the railway.

The valley of the Kwilu-Madiata appears to combine all the desirable conditions for agriculture: the forest of Ziaka and the village territory of Tholo supply an abundance of varied cultivable lands.

The purpose of the other three missions was to look, in the region of the Equator, for lands of some area suitable for growing *Hevea brasiliensis*. M. Lefèvre visited the basins of the rivers Ruki, Momboyo, Lokolo and Luilaka Throughout this region no land is suitable for the establishment of rubber plantations, nor combines the essential conditions for working on an economic basis. With the exception of a block of 2 000 hectares (5 000 acres) of land suitable for growing Hevea, lying east of the post of Monkoto, the entire region is one vast morass, from which there emerge wooded islets (Copal trees, Kola trees, Safo, Rubber Lianes, *Elaeis guineensis*). The soil is sandy, black and humous, while the subsoil is formed of sand and yellow clay lying on a bed of limonite.

M. Bellefroid traversed the zone of the Maringa-Lopori. In the region lying in the centre of this zone, lands presenting the desired economic condition for the establishment of great centres of cultivation are found in abundance, principally in places along the parting line of the Bolombo — Lopori waters and the Congo — Lopori ridge line.

On the contrary, the regions lying east and west of this zone are not capable of great agricultural development, the former being of a very broken character and the latter covered with marsh.

M. Eschweiller visited the territories of the basin of the Tshuapa (South-East of the District of the Equator). North-East of Mondombe extends a vast, slightly undulating plain covered with forests or brushwood; the soil is clay-loam or sandy loam wirh clay subsoil, and here and there a few outcrops of limonite. The region is rich in high forest and recent woods, in which "parasoliers" are very numerous. Rubber lianes and also small groups of *Elaeis* palms are encountered in many places. Rain is abundant and regular in Mondombe; the yearly rainfall, taking the great and the short rainy season together, is from 1 500 to 2 000 mm. (60 to 80 in.). Generally, the lands under investigation do not present those conditions requisite for the establishment of great rubber plantations, either in consequence of their deficient fertility or their insufficient extent, or again by reason of the presence of many marshes. An exception is formed by one site of about a thousand hectares (2 471 acres), lying a short distance North-East of Mondombe.

In conclusion, the results of these missions make it evident that the extraordinary development of the water system is a serious obstacle to the utilisation of many of the regions in the Equator district. Most of the water-courses, which are extremely numerous and close to each other, form marshes all along their banks for a width of 50 to 500 metres (55 to 550 yards). Furthermore, in some regions the recruiting and victualling of labour would be difficult.

Apart from the lands recognised as good but of too small extent, situate near Monkoto, Mondombe and Yalokosa, only the Congo-Lopori and Lopori-Bolombo ridge lines are really adapted for the establishment of great centres of cultivation of *Hevea brasiliensis*. These two regions combine the maximum of favourable conditions: very fertile soil over a vast area, a dense and essentially agricultural population, excellent health conditions and easy communications owing to the proximity of streams navigable at all seasons. In view of the value of the lands lying between the rivers Lopori and Bolombo, the Government of the Colony has created at Djombo an important agricultural station for planting rubber species.

277 NICHOLSON. **Agriculture in the Transvaal and the Neighbouring Provinces** (1). — *International Economic Review*, Vol. IV, No. 3, pp. 491-520. Bruxelles, 15-21 Décembre 1911.

Union of South Africa

Prior to the discovery of gold, agriculture properly so-called was unknown in the Transvaal; the Boer cultivated nothing but what was necessary for the consumption of his family and himself, giving all his thought and care to the natural increase of his cattle, sheep and goats, besides a hardy race of ponies.

Thanks to the energetic measures of the Agricultural Department instituted after the war much has been done to hasten the progress of general agricultural development; and at the present time many farmers are in a position to make a thriving business of the farm they are able to purchase.

The area of a Transvaal farm is generally about 7 500 acres. The differences of altitude added to the physical features of the contry itself facilitate the cultivation, in certain regions, of semi-tropical plants, such as coffee, cotton, pine-apples and bananas: in other parts horned cattle are to be found in large numbers, whilst horses and sheep are most general on the middle and high veldt and are a profitable source of income to their owners. Maize and other cereals are also grown on a large scale in some districts of the middle and high veldt. But all over the country there are vast tracts of land that have never been exploited in the European sense of the word.

There is no doubt that in the course of the last few years the quality of the cattle, kept by progressive farmers, has considerably improved and it is probable it will continue to do so in the immediate future. The most wide-spread of the foreign breeds are the following, in order of importance: Friesland, Shorthorn, Ayrshire, Devon, Hereford and a few others such as Jersey, Polled-Angus, Sussex and Welsh.

The indigenous Afrikander breed as well as the product of many years' acclimatisation are the species of cattle preferred by the Boers and the recent precautions taken to preserve the purity of the race have greatly contributed to increase the popularity of this profitable kind of stock.

The ravages caused by the fever epidemic on the east coast have resulted in a serious falling off in the cattle trade. It is quite possible that by adopting the system of dipping for the cattle, the disease may be more easily overcome than hitherto.

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(1) See *B* Jan 1911, No. 16

A question that calls for special consideration at the present moment is whether dairies on the costly scale of those existing in two districts can give profitable returns as long as milch cows taken as a whole, are of no better quality than they are at present.

The species of horse usually bred in the Transvaal is that known by the name of " boer ". It is invaluable for riding, and as a beast of burden, is full of endurance, and unequalled as a draught horse for the Cape cart. The Agricultaral Union cherishes the hope of being in a position to hold Horse-Shows in different centres in order to have the opportunity of advising anyone desirous of making better bargains than can at present be obtained from horse-dealers. It is satisfactory to be able to state that a considerable number of the farmers are endeavouring to improve the quality and size of their products. The Orange Free State and various parts of Cape Colony are admirably suited to the breeding of horses.

The sheep are rapidly increasing in numbers. Generally speaking these flocks are made up of a mixture of Cape, Mixed, Persian and Merino breeds, except on the High Veldt where numerous flocks of pure bred Merinos are to be found. Goats too, of various kinds, are not infrequently met with among the sheep. But the European breeds so common in England and Australia are hardly ever seen here. This proves that even the farmers owning the best sheep are gradually giving up caring to produce good mutton in order to concentrate their efforts on the production of wool for which the Merino sheep is celebrated.

Great improvements have been made, thanks to the efforts of competent agents employed by the Transvaal Government, to assist the farmers in working by modern methods.

Numbers of the principal sheep-breeders, at great expense, have imported Rambouillet rams from France, as well as Tasmanians and Wanganella from Australasia. Vast tracts of land in the Orange River and Cape Colonies are capable of producing excellent mutton as well as a fine quality of wool.

The pig is generally considered to be a negligible quantity on a Boer farm. But several European breeds have been imported, and in Natal, factories have been started for drying and smoking pork.

Poultry has greatly improved during the last few years and nearly all the European and American breeds have been introduced.

Maize is more largely cultivated in the Transvaal than any other cereal. There is no doubt that both soil and climate favour the production of a quality unrivalled in any other part of the world. But the methods employed leave much to be desired. The average crop is 5 bales per acre. The Government, however, is doing everything in its power to improve the system of culture.

Comparatively little wheat is grown, and the importation of flour seems to be on the increase. Thanks to the introduction of new varieties and the practice of dry-farming it is hoped it will soon be possible to satisfy all local requirements. The average crop on dry and irrigated land is estimated at about 7 sacks of 178 lb. per acre.

Oats are generally of inferior quality. The native malting barley is not very suitable for brewing. Barley is largely sown as a green crop for stock. Lucerne, millet, teff-grass, clover and rye-grass are sown for forage. The growing of such crops as mangolds, rape, etc., is spreading rapidly. Soy beans have been recently introduced into the Transvaal. Tobacco is finding favour with an increasing number.

Vegetable-growing is chiefly in the hands of the Portuguese, Italians and Greeks. Many kinds of fruit are produced, from subtropical kinds of the West Indies to the ordinary European fruits. A promising export trade has gradually been developing and certain of the fruits thus exported fetch high prices on the London market.

In various parts attempts have been made to grow cotton, though with what result too little is definitely known for it to be possible to form any opinion as to the profitableness of the land appropriated for the purpose.

Throughout the whole of South Africa, numbers of private individuals have built reservoirs, thus making it possible to irrigate vast extents of country; but the Government has done very little in this respect compared with what one sees in other semi-arid countries.

278 OLIVER, F. (Brit. cons. in Paraguay). **Agriculture in Paraguay.** *Diplomatic and Consular Reports*, N°. 4815, pp. 1-14. London, November 1911.

Paraguay

The chief products of Paraguay are tobacco, yerba mate, oranges, timber, quebracho extract and hides. It is said that the climate and soil are peculiarly suitable for the cultivation of cotton, but the cultivation has not hitherto been worked on a commercial basis. The quality of the cotton planted in the Chaco is said to be of the finest known. Coffee, sugar, rice, manioca and other products are grown for local consumption, while essence of the leaves and flowers of the bitter orange, which grows wild in the forests, and palm kernels, are produced in some quantity for export.

As a field for land speculation Paraguay appears to offer considerable attractions at the present time, but intending immigrants, with small capital, will be well advised to rent land first, till they become thoroughly acquainted with local conditions.

Tobacco growing is also one of Paraguay's most important industries. Havana seed was first introduced in 1900. Since the introduction of the system of an official classification of tobacco for export with a view to improving the sale of Paraguayan tobaccos in foreign markets, the amount presented for classification has constantly increased and now comprises about two-thirds of the total production. Quebracho extract is produced on a large scale at Puerto Galileo, Casado, Sastre, Max and Maria and the factories are able to produce about 3000 tons of extract per month.

Timber is worked on a large scale in many parts of the country by a number of important companies, some of which have built private railways for the exploitation of the forests. Although the greater part of the yerba maté is taken from the forests, the plant is cultivated in some localities with profit.

Both the country and the climate are exceedingly favourable to cattle-breeding, and the rate of production is remarkably high.

Land suitable for cattle fetches from £600 to £2000 per league (1860 acres). The latter price would be for the best land, well situated as regards communication by rail or river. Land in the Chaco, or part of the country which is little known and almost entirely undeveloped, is cheaper. Some of the lands, which are ordinarily suitable for cattle-raising are liable to inundation.

There is a good demand for cattle, both for local consumption, and for the factories of preserved meat and meat extract. Horse-breeding in Paraguay, on the other hand, does not thrive, owing chiefly to the prevalance of *Mal de Cadeira* a fatal disease, which attacks horses and goats, the cause of which is, at present, undetermined.

The most important industrial undertaking in Paraguay owns about 1250 square kilometers of yerbales, 6 ½ square kilometers of planted yerba, as well as 1500 square kilometers of forests and pasture lands.

Besides sugar factories, two breweries, meat extract and dried meat factories, many of the simpler industries are represented on a modest scale, such as matches, soap, oil, starch, candles, tanning.

RURAL HYGIENE.

279 ROSS, R. **Malaria in India**. *Nature*. No. 2200, Vol. 88, pp. 284-286. London, December 28, 1911.

Major W. H. Kenrick has studied the effect of malaria on birth-rates and death-rates in the Central Provinces, British India. He has compared thirty-four healthy villages possessing a spleen-rate of only 4 per cent., and a total population of 19 064, with thirty-three « hyperendemic » villages with a spleen-rate of 80 per cent. and a total population of 10 825, and concludes that malaria frequency of over 80 per cent. (spleen-rate measure) causes an increase of from 10 to 15 per mille of total death rate.

British ndia

Colonel J. R. Adie found Plasmodia in 38 out of 150 at Delhi Fort, Punjab, in November, 1910, and in 29 out of 71 children there. Yet all these were undergoing « prophylactic quinine treatment » at the time. This confirms the observations of Malcolm Watson and others that quinine is of little use in regions of very high malaria-frequency.

The simplest, though not quite exact, method of measuring malaria-frequency is by observing the frequency of enlarged spleen (spleen-rate). Thus in Mauritius in 1907-8, in 30 137 children examined at the writer's suggestion, it was estimated that the average size of the spleen was 2,54 times the normal, the whole number of children affected being 34 per cent of the total number examined.

In 1898, while infecting birds with Proteosoma by the bites of *Culex fatigans*, the writer observed that out of 5 sparrows which originally contained a very few Proteosoma, 4 showed a much more copious infection a week after being subjected to the bites of heavily infected mosquitoes. At the same time the infection of these birds was not so copious as in the case of most of the originally uninfected birds. This suggested *a*) that fresh bites of infected mosquitoes will cause a severe recurrence even in subjects already infected; but that *b*) this recurrent iufection, though severe, will not be so severe as an original infection, probably owing to the previous establishment of partial immunity.

Major Christophers now reports (*Scientific Memoirs, Government of India*, No. 46) two more similar experiments which tend to confirm the possibility of such reinfection.

The importance of these points is rendered very manifest by the writer's quantitative studies in epidemiology by which it is shown, for instance, that if 50 per cent. of the people are constantly affected under constant conditions, then about 63 per cent. of them will probably be infected or reinfected every 4 months. In such circumstances it will be extremely difficult to keep down the fever by quinine alone.

Dr. C. A. Bentley has published a report on malaria in Bombay and its prevention. He concludes that the principal measure must be the reduction of the carrier of the disease, *Neocellia Stephensi*. The cost should be about 100 000 rupees (about £. 6670) a year.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY.

Research Scholarships in Agricultural Science. — *Agric. Economist and Horticultural Review*. Vol. XLIV. No. 504. (New Series) p. 319. Dec. 1911. **280**

Great Britain

The Board of Agriculture and Fisheries has awarded twelve of these scholarships in agricultural science.

The scholarships have been established in connection with the scheme for the promotion of scientific research in agriculture, for the purpose of which the Treasury has sanctioned a grant to the Board from the Development Fund.

The scholarships are of the annual value of £150, and are tenable for three years.

They have been established in order to train promising students, under suitable supervision, with a view to their contributing to the development of agriculture, either by carrying out independent research, or by acting in an advisory capacity to agriculturists.

GUILLEMET, G. **Agricultural Education in France.** (L'enseignement agricole au Congrès de l'Alliance Républicaine Démocratique de France). — *Journal d'Agriculture Pratique*, No. 49. Paris, 7 Décembre 1911.

The following are the conclusions of the report presented by M. G. Guillemot, the author of the first bill on the reorganisation of communal and departmental agricultural education, to the Congress of the Republican Democratic Party held in Paris in the first half of December 1911.

1. In the primary school, a special direction of study to be given in all agricultural regions; this is the principal basis of all progress in agriculture.

To this end, the necessity of training good teachers; this can only be done by altering the programmes of the Normal Schools. The necessity for an understanding between the Ministries of Agriculture and Public Instruction.

2. Professional character to be given to Continuation School work: housekeeping schools for girls; temporary courses of study for young men; lectures; libraries; lectures in barracks; distribution of pamphlets and newspapers.

3. Reorganisation and increase of the number of practical schools.

4. Complete reform of the normal education as given by the professors of agriculture; increase of appropriations for this purpose, which are notoriously inadequate.

5. The demonstration in all branches of agricultural education of the benefits to be derived from farmers' provident and co-operative institutions.

Agricultural Trains to Tour Eastern Canada — *Montreal Daily Star*, Dec. 20, 1911.

" A new departure in the way of agricultural education will probably take place in the Provinces of Ontario, Quebec, and New Brunswick next spring and summer ".

" The Canadian Pacific Railway is now negotiating with the governments of these provinces with a view to having special agricultural trains tour every part of the provinces, in order that demonstrations and lectures may be given to farmers with a view to improving the productive capacity of the farms ".

"The system has been in operation in Western Canada for some years past and has proved so beneficial that the C. P. R. is now making the effort to extend the same benefits to the east. The company's proposal is meeting with favorable consideration in the case of all three provinces".

"If the scheme is adopted, special trains with lecture and demonstration cars, and with professors from the various agricultural colleges will spend the spring and summer going over the provinces, and stopping at all the principal towns for lectures and demonstrations, to attend which farmers will be granted reduced fares from all over the various districts. Dairy farming, fruit farming, stock raising and a good seed propaganda will all be treated from a scientific point of view, and in such a way as to afford the maximum of practical help and encouragement to the farmers in every locality".

Agricultural Research: Investigations at Cambridge. — *Morning Post.* London, Dec. 26, 1911.

The School of Agriculture of the University of Cambridge will, it appears, be one of the first agricultural institutions to benefit from the Development Grant that has been assigned to the Board of Agriculture for the promotion of research.

Improvement of Wheat.

The improvement of English wheat by cross-breeding is perhaps the chief problem at which the Agricultural School of Cambridge has been working for the last decade.

Two of the Cambridge hybrid wheats are an acknowledged commercial success, but much remains still to be accomplished.

Two new hybrid wheats have already been distributed, and now cover many hundreds of acres. One combines the high yield of the more vigorous English soft wheats with the excellent milling and baking qualities of Manitoba Hard; the other gives phenomenal yields, because of its resistance to yellow rust, which has been estimated to diminish the world's wheat supply by something like 30 per cent.

The Problem of Animal Nutrition.

This is the second great problem which is under investigation in Cambridge.

The interest of the question is bound up in the mystery of the class of food-stuffs known to physiologists as protein.

A protein is a compound containing about 52 per cent of carbon, 7 per cent of hydrogen, 16 per cent of nitrogen, 24 per cent of oxygen and 1 per cent of sulphur. But in the individual proteins, though the composition remains constant, the elements are combined according to different groupings.

Till quite recently, the physiologists have thought that an animal required so much protein per day to be healthy.

Further experience has shown that the process is far more complex than was supposed, the proteins are now recognized as a large class of bodies built up in very different ways, and the significance of this knowledge spells profit or loss to the farmer.

Work is actively in progress at Cambridge, the aim of the investigations being to find out whether certain food stuffs are deficient in the necessary protein for any particular animal. It has already been shown that the addition to maize of a substance known as tryptophane, a constituent of animal proteins, enables animals to utilise to better effect the protein of maize.

A special building with a laboratory attached, has already been erected, where chemists can make experiments on the digestibility of fodder. Hitherto all data on this subject are from American or German sources and of doubtful bearing on English products.

Experiments on Inheritance.

The Cambridge School have also attempted to grapple with the difficult subject of inheritance in animals. Sheep and cattle breeding experiments are in progress, but the poultry work is more advanced.

Soil Surveys.

Several private benefactions have enabled the Cambridge staff to undertake soil surveys of Norfolk and Huntingdonshire. The soils of these counties have been already examined, sampled and analysed. Reports are being prepared on the lines of Messrs Hall and Russell's excellent monograph on the soils of Kent, Surrey and Sussex, giving the composition and agricultural characteristics of each type of soil. The survey is now being extended to Cambridgeshire and the Isle of Ely, and to the pasture district of Northamptonshire, and it is the ambition of the staff to include, as time permits, the whole of the Eastern counties.

Researches on Sugar Beet.

Several acres of the experimental farm are being devoted to beet-growing, and the roots are dug up and brought into the laboratory to be tested, one by one, for their sugar content. The roots that give the best yield in sugar are being selected for seed, so that a pedigree strain of sugar beet may be ready to hand if the sugar beet industry is ever established in this country.

While, at present, the whole question is in the experimental stage, it may be noted that, unless an English source of seed can be relied upon, the industry might at any time be seriously injured in the early stages of its development, by the supply failing or being withheld.

Researches on Diseases.

At the field laboratories; various experiments are being conducted in connection with animal diseases.

The mysterious bee disease, which has been so deadly during the last few years, is being investigated.

Summary of Past Results.

Perhaps the most outstanding achievement is the production of the two new wheats Burgoynes Fife and Little Joss.

Pure strain of standard varieties of oats and barley have been distributed and are now grown over large areas in the Eastern counties. The Cambridge cereals are eagerly sought after.

The advice of the staff is frequently sought upon all kinds of subjects connected with agriculture.

AGRICULTURAL INSTITUTIONS.

Agricultural Extension Work in the United States. — *Modern Miller.* St. Louis, December 2, 1911. **884**

United States

The United States Secretary of Agriculture states that the Department of Agriculture in conjunction with farmers' institutes, conducted 71 instruction trains covering tours of over 40 000 miles during the last year and that the department has collected and published information respecting the organisation and conduct of county fairs. Over 12 000 fair associations are in operation in the several States, representing a membership of over 246 000. In 1909 the gross income was about $ 6 500 000 (1) and the amount paid in premiums over $ 2 500 000. The attendance that year was between 15 and 16 million people.

In speaking of the results and effects of this work the secretary said that the awakening of the people to the value of agricultural instruction and to the possibilities of usefulness through extension teaching has created a demand for this instruction far beyond the power of the states to supply.

The inadequacy of present equipment for meeting the agricultural educational needs of rural people has become so apparent that several bills have been presented to Congress looking to additional appropriations for carrying on extension work.

The States also are adding annually to their appropriations for agricultural extension in a marked degree. California during the past year increased the appropriation from $ 10 000 for institute work to $ 15 000 per year; Illinois from $ 23 650 to $ 29 000; Kansas from $ 27 500 to $ 35 000; Minnesota from $ 18 000 to $ 23 000; Nebraska from $ 10 000 to $ 17 500; New York from $ 25 000 to $ 35 000; Ohio from $ 22 000 to $ 26 400; Oklahoma from $ 5 000 to $ 10 500; South Dakota from $ 9 400 to $ 13 000; Utah from $ 8 500 to $ 10 000.

These appropriations show in an unmistakable way, growing interest in agricultural improvement by the States, and their confidence in the value of the work of the farmers' institutes as well as appreciation of what they have done for agriculture in the past.

AGRICULTURAL SHOWS AND CONGRESSES

285 **British Silk Exhibition, 1912.**— *Journal of the Royal Society of Arts*, No. 3082, Vol. LX; p. 135. London, Dec. 16, 1911.

United Kingdom

Under the auspices of the Silk Association of Great Britain and Ireland, an exhibition will be held from June 5th to 19th, 1912, in London, at Prince's Skating Club, Knightsbridge, S. W., with the object of bringing before the public the great advance that has been made in the production of home-made silk fabrics.

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(1) $ 1000 = £ 205 10*s*.

French Horticultural Exhibitions in 1912. — *Le Moniteur d'Horticulture*, No. 24, pp. 277-278. Paris, 25 Déc. 1911. 286

France Algeria

The 17th Congress of the Society of French Chrysanthemum Growers is organising a large Chrysanthemum Show which will be held at Nantes from the 12th to the 17th November 1912.

In addition to chrysanthemums there will be exhibited flowers in season, fruits, vegetables and various nursery and ornamental articles.

At Oran, in Algeria, from the 20th to the 28th April, there will be held an exhibition of early flowers and trees, and also products of the industries and arts connected therewith.

Agricultural Exhibition at Cairo. (Rep. of the Brit. Consul at Cairo). — *The Board of Trade Journal*, No. 788, p. 16. London, Jan. 4, 1912. 287

Egypt

An agricultural exhibition is to be held at Cairo and will be opened on the 15th February 1912. Exhibits will consist of all kinds of machinery, manures and products of industries connected with or arising from agriculture; also cotton and local manufactures.

Exhibitors can obtain favourable rates for the carriage of their exhibits over the Egyptian railways.

International Rubber Exhibition at New York. — *The Board of Trade Journal*, Vol. LXXV, No. 787, p. 635. London, December 28, 1911. 288

United States

The third International Rubber and Allied Trades Exhibition is to be held at New York in September, 1912. Particulars may be obtained from the London office of the Exhibition Manager, Mr. A. Staines Manders, 75, Chancery Lane, W. C.

CROPS AND CULTIVATION

AGRICULTURAL METEOROLOGY.

280 PALAZZO, LUIGI. **Agricultural Meteorology in Italy.** (La Meteorologia agraria in Italia). — *Meteorologia e Geodinamica - Cinquanta anni di storia italiana.* Roma, 1911.

Italy In this work, Professor Palazzo, director of the Central Meteorological and Geodynamic Office at Rome, gives a historical survey of the organisation of the meteorological and geodynamic services in Italy, and brings out clearly the progress in these sciences during the last 50 years.

We shall dwell more fully on the following chapters, which are of special importance from the point of view of agricultural meteorology:

I. Agricultural and storms service; agricultural weather review.

II. Telegraphic weather and forecasts service; daily weather report.

III. Government Stations for the study of storms and for checking experiments for the prevention of hail.

I. AGRICULTURAL AND STORMS SERVICE; AGRICULTURAL WEATHER REVIEW. — A section of the Office is entrusted with the work of collecting and working out reports on the storms occurring in Italy. These reports reach the Office on special postcards printed on a uniform model, which are filled in by all the observatories and thermohydrometric stations within the Government system.

The same section is entrusted with what is known as the Agricultural Service; it consists in collecting and co-ordinating the data from special postcards which the whole of the observatories forward every 10 days; these postcards convey brief reports on the extreme temperatures, the cloudiness of the sky; the rainfall, and also special information as to the condition of the country, the crops of various agricultural produce and the course of farm work. These reports serve for the preparation of the agricultural weather review, which is published every 10 days.

2. TELEGRAPHIC WEATHER AND FORECASTS SERVICE; DAILY WEATHER REPORT. — The observations reaching the Office every morning by telegraph form the material for the daily weather Report. This Report consists of a lithographed four-page sheet containing three charts: a chart of the isobars (at 7 or 8 a. m.) for Italy, and a large portion of the Mediterranean, accompanied by graphic indications of the condition of the sky and sea, rain, wind, etc.; a chart of the isotherms for Italy, and lastly a third smaller chart reproducing the isobars for the whole of Europe.

At 2.30 p.m. the weather telegram is drawn up and is immediately telegraphed to observatories, semaphores, etc. This telegram gives particulars as to the distribution of the maxima and minima of barometric pressure in Europe; it states in brief the meteorological phenomena which have occurred in Italy during the previous 24 hours; the weather conditions for the morning in Italy and the state of the barometer for that country; lastly, the telegram indicates the probable weather, which the endeavour is now being made to forecast every day, even if the data are scanty and uncertain.

In 1900 the Ministry of Agriculture admitted the communes of the Kingdom, Agricultural Committees and Anti-hail Associations among the subscribers to the Daily Weather Telegram, reduced merely to a forecast of the probable weather, on payment of a small charge.

3. GOVERNMENT STATIONS FOR STUDYING STORM PHENOMENA AND FOR CONTROL EXPERIMENTS AGAINST HAIL. — Although the results of the measures taken against hail in the form of rockets, hail-arrester cannons etc., were negative, the Italian Government nevertheless deserves the highest praise for having from the first largely and energetically, contributed regardless of expense, towards the success of the undertaking.

M. Palazzo deals briefly with the principal points of this problem, and gives a short historical account of the campaign against hail in Italy.

290 BROUNOFF, P. I. **Observations on the Phenomenon of Hoar Frost in Southern Russia.** (Po Povodu Samietki T. P. Vanghengheima ob Oxeliedi v Kurskoi Gub). — *Xurnal Opetnoi Agronomii* (Journal of Experimental Agriculture), God. XII, Kniga 5, pp. 775-776. S. Peterburg, 1911.

Russia

From a detailed study of meteorological year books, M. Brounoff was prompted to seek among general meteorological conditions for the cause of the hoar frost observed in the Kursk Government from the 18th to the 30th November 1909.

Before the appearance of the hoar frost there were fogs and rains in Southern Russia, with high temperature and low barometric pressure.

Then, on the 18th November, a cold current from the North suddenly traversed the Government of Kursk; the temperature dropped to zero and characteristic ice crusts formed on the plants.

By drawing up a chart of isobars in millimetres (not in 5 millimetres) the author was able to bring into prominence quite a series of small depressions and distinct maxima, which are closely related to the direction of the winds and the distribution of the rain. It is seen that the different depressions moved towards the East, and the chart of isotherms furthermore shows that the isotherm zero, in its turn determined by the course of the barometric maxima in the North of Russia, shifted towards the South on the 18th November and passed through the Government of Kursk.

The author afterwards considers the formation and displacement of the maxima, and puts forward the idea that the phenomenon of hoar frost, which is connected with the appearance of cold waves, is closely related to the general movements of the atmosphere; it might therefore always be shown by the preparation of very detailed weather charts.

291 PRXISCIKHOVSKII R. **Rains and the Cereals Crop in the Government of Kherson, Russia.** (Materiali dlia Klimatologhii Khersonskoi Gubernii po Dannem Sobrannim Elisavetgradskoiu Semskoin Meteorologhiceskoiu Stanzieiu). — *Xurnal Opetnoi Agronomii* (Review of Experimental Agriculture), G. XII, Kniga 1, pp. 154-155. S. Peterburg, 1911.

Russia

As meteorological elements vary greatly in their yearly and monthly means, a definitive judgment on the general climatic conditions of a region requires a series of observations extending over several years.

The author, utilising the material gathered during a period of 35 years, undertook the study of the climate in the Government of Kherson, and he is publishing short preliminary notes on different subjects. The present work deals with the rainfall in relation to the drought and crops.

From this it appears that the crops depend less on the quantity of rainfall than on its distribution. The author has drawn up a special table, accompanied by diagrams, recording the dry and rainy periods. The following interesting conclusions may be drawn:

1. A plentiful annual, and even spring, rainfall, does not always guarantee a good harvest.
2. A medium rainfall is quite sufficient, provided it is possible to retain the moisture in the soil.
3. Autumn rains increase the yield of winter cereals.
4. Abundant winter rains raise the yield of winter and also spring cereals.
5. Summer rains have no effect on winter cereals, but greatly increase the crop of spring cereals.

FIELD, J. H. **Weather Forecasts in British India.** *Report on the Administration of the Meteorological Department of the Government of India in 1910-1911*, pp. 1-22. Simla, October 28, 1911. **292**

British India

The frequency of cyclones, and the effect of the more or less punctual arrival of the rain-carrying monsoons on the progress of crops, suffice to make clear the great importance of the problem of forecasting the weather for both a short and a long time ahead in India.

In this connection, we reproduce from the Annual Report of the Central Meteorological Department of the Government of India, the following particulars which are of more special interest.

Forecasting Storms, Floods, etc. This department is specially entrusted to the Meteorological Station of Simla, and partly to that of Calcutta, which devote a continually increasing activity to the question. This is shown by the fact that whereas in 1908-09 and in 1909-10 the Simla station forwarded 1199 and 941 telegraphic reports respectively, it sent no less than 2649 in 1910-11.

Warning of approaching Monsoons. The news of approach of the monsoons is communicated to the press, the governments and the local administrations, and is published in the official Gazette of the Central Meteorological Department.

The following example shows how the forecast is prepared.

Memorandum of the 6th June 1910.

a) General conditions rather normal. There is no reason to expect scarcity or excess of rain brought by the monsoons.

b) The rains will nevertheless be less continuous, especially those due to the marine current coming from the Arabian coasts. Periods of relative scarcity of rain will alternate with sudden violent showers.

c) The current from the Bay will be more active than the Arabian current and the rainfall due to the former of these currents will be more abundant.

293 **The Meteorological Service in the Island of Cuba.** — *Boletin Oficial de la Secretaria de Agricoltura, Comercio y Trabajo. Edicion Semanal de Negociado y Meteorologia.* Cuba, 25 Noviembre 1911.

Cuba

The Secretary's Office of the Ministry of Agriculture, Industry and Commerce in the island of Cuba, publishes every week a Bulletin of Agricultural weather reports. This Bulletin consists of two large pages, and comprises a general and a special part. In the general part are published the average maximum and minumum figures relating to the rainfall and temperature, together with detailed information on the general condition of the principal crops (sugar-cane and tobacco) and farm work.

The second part is devoted to the observations of correspondents in the various provinces and districts. It deals with the local conditions in relation to various crops, and endeavours to bring out clearly the action on the latter of one or another weather factor.

AGRICULTURAL GEOLOGY.

294 KOSSOWITSCH P. **Processes of Formation of Agricultural Soils and Fundamental Principles of their Classification.** (Die Bodenbildungsprozesse und die Hauptprinzipien der Bodenklassification. *Verhandlungen der Zweiten Internationalen Agrogeologenkonferenz.* p. 232-254. Stockholm, 1911.

Russia

At the present time it is becoming more and more clear that the physico-chemical and biological phenomena having their seat in the soil must be regarded, either singly or as a whole, as the most rational basis for the classification of agricultural soils.

It is needful therefore to study the characteristic forms of typical soil formations, and the mutual relations between the different factors, to enable us, by a knowledge of their conditions of genesis, to divide and group the different species of soils according to established types of formation.

Every formative process is the result of the complex action of very diverse agents, such as climate, geology, flora, etc., and it is by the combination in which these agents act that the conditions and direction of development of the process are determined.

The various aspects presented by the earth from the standpoint of physical geography: desert, steppe, tundras, etc. correspond to perfectly clear and well defined combinations of the formative factors.

It is natural therefore that for each physico-geographical aspect there should be a corresponding characteristic type of soil formation.

The following fundamental types may be distinguished:

1. Desert formation type.
2. Semi-desert formation type.
3. Chernozem (Black Earth) formation type.
4. " Podsol " formation type.
5. Type of formation peculiar to the tundras.
6. Type of formation of peat lands.
7. Type of formation of clays.

Before describing these various types of formation it should be noticed in the first place that the process of formation is especially characterised by ·

1. The rapidity and nature of rock degradation.
2. The rapidiy and character of the decomposition of organic substance, and the sub-division and distribution of humic substances at the different depths.
3. The passing of the substances from one state to another and the elimination of some substances by the soil itself.

1. *Process of Formation of Desert Soil.*

Owing to the extreme scarcity of moisture, this soil is independent of animal and vegetable life. Chemical degradation takes place in an alkaline medium with high concentration of the soil solutions. The great evaporation at the surface results in a rise of the water towards the surface with an accumulation of soluble salts, which thus form the characteristic lime and gypsum crusts, and the no less characteristic saline efflorescences.

2. *Process of Formation of the Steppe Soils.*

This formation likewise takes place in a dry medium, but the quantity of water suffices to give rise to grassy vegetation.

The rainfall being comparatively small, the formation of soil takes place in consequence of the presence of energetic bases in an alkaline medium. It is manifested not only by the lixiviation of the soluble salts and carbonate of lime and magnesia in the superficial strata, but also by the carrying away of the sesquioxides and silicates in suspension in a colloidal state. Owing to this, many earths of the type in question show a characteristic structure with the clearly distinct formation of three strata.

1. The superficial stratum, loose and flaky, containing a small quantity of earthy particles of oxide of iron and clay; it may be entirely devoid of carbonate of lime and magnesia.
2. The middle stratum, of solid compact structure, rich in earthy particles, with a great deal of clay and oxide of iron.
3. The deep stratum, particularly rich in carbonate of magnesia and carbonate of lime. Deeper down another stratum is found characterized by the accumulation of very soluble salts.

3. *Process of Formation of Black Earths.*

The degree of moisture is much higher than in the previous cases; the lixiviation is energetic; vegetation plays a considerable part in the formation of the soil. In these types of soils not only the readily soluble salts but also the carbonates of lime and magnesia and sulphate of lime are carried away and deposited beneath the humiferous stratum. The soluble salts are carried down very deep and the depth at which they collect and the cover of vegetation which prevents immediate evaporation of the water coming in, render it very difficult for these salts to return towards the surface. The earthy particles are hardly carried away at all, and the characters of the combinations of silicates, clays and oxides of iron vary but little with the depth.

The process of formation of Black Earths, theoretically takes place in a neutral medium, but as in reality conditions of perfect equilibrium never occur in nature, the reaction is in fact sometimes slightly alkaline, sometimes feebly acid.

4. *The Process of Formation of the "Podsol"*

The growth of vegetation is very abundant; the moisture is sometimes plentiful enough to make oxidation of the organic substances difficult, and this results in the formation of a great mass of humic substances of an acid character, and the diminution of ferric oxide.

Lixiviation proceeds very energetically ; not only are the readily soluble salts carried away, but also the carbonates of lime and magnesia. Thus, in the superficial strata, basic substances are not sufficient in quantity to neutralise the humic acid ; the formation of the " Podsol " takes place in an acid medium.

In all the formations belonging to this type two different strata are distinguished :

1. A superficial stratum, whitish in colour owing to the loss of iron salts ;
2. A deep stratum, with brown layers rich in earthy particles.

All these processes can be observed and thoroughly studied in the light-coloured soils of the northern wooded regions, cold and moist in climate, which are distinguished in Russia by the name of " Podsol " (dry ash).

5. *Process of Formation of the Tundras.*

This formation has had little study devoted to it up to the present. Rains are not plentiful, but evaporation is so slight that it allows of sufficiently energetic lixiviation ; on the other hand the low temperature, notwithstanding the sparseness of vegetation, leads to a noteworthy accumulation of humus, which is deposited on the surface in the form of a peat stratum.

6. *Formation of Peat lands.*

This is exactly the opposite of the formation of deserts. While in the desert the soils lose their mineral substances only under the influence of winds, and are formed independently of vegetable life in an alkaline medium, in peat lands on the contrary the mineral substances are carried away by the wind in the form of dust, or by the rains in solution, the mass of the soil is formed by plants, and the decomposition of the organic substances takes place with a strongly acid reaction.

7. *Process of Formation of Laterites.*

A great abundance of water, and high temperature. Under these conditions, vegetable residues decompose rapidly, and the decomposition is sometimes complete and accompanied by an abundant formation of carbondioxide and a feeble formation of humic substances. In hot and moist tropical zones the humic acids therefore play no part in degradation of the soil. Lixiviation, except as regards clays and oxide of iron, takes place in relation to all bases, and also to a large quantity of silicious acid. The soils thus formed are therefore characterised by the almost complete absence of silica, and the abundant presence of hydrates of iron, which impart to them a characteristic ruddy tint.

All these soils may be comprised in the group of " genetically independent ,, soils in order to distinguish them from another group of soils the origin of which is subsidiary to the existence of the former.

1. *Saline soils* which form, under favourable topographical conditions in the steppe region, by the action of the water circulating in the soil, and which deposit a large quantity of salts at certain important points.

Where the salts of strong acids like hydrochloric and sulphuric acid are in question, "amorphous saline salts " are obtained, white in colour ; with the salts of weak acids (principally carbonate of soda) on the contrary, " black saline soils " of massive structure are obtained.

2. The waters originating from black earths are poor in salts of strong acids, and thus sometimes contain carbonates of lime and magnesia alone.

The saline soils derived from these are therefore generally the " saline black soils ", massive in structure.

3. The waters coming from the " Podsol " lands produce " low peat lands (deposit) ", very rich in iron salts.

4. The waters from clayey soils are, like the soils which result from them, characterised by the large quantity of silicious acid they contain.

As has already been said above, these different types are not always clearly distinct, but there is quite a series of transitions and intermediate conditions between one and another. While the type of formation of clay soils is rather independent and isolated, the other five represent, as it were, the stages of a progressive process which takes its rise in an acid medium and with a large quantity of energetic bases ; the latter are afterwards gradually neutralised by the humic acids. These five types may be divided into two groups :

1. *Alkaline* : Desert, Steppe, Chernozem (Black Earth).
2. *Acid* : Soils of the " Podsol " and Tundra types.

The following is a schematic table of the genetic classification of the soils according to their different types of formation :

Classe A. Genetically independent soils.
I. Typical desert soils :
  a. Calcareous and gypsum crusts.
  b. Dry saline soils.
  c. Desert sand.
II. Typical Steppe soils :
  a, Light coloured soils.
  b. Greyish brown soils of flaky structure, and compact.
  c. Chestnut colour soils.
III. " Black Earth " soils :
  a. Black Earth or Chernozem proper.
  b. Decomposed black earths.
  c. Rendzina humic and calcareous black earths.
IV. Soils of the " Podsol " type :
  a. Grey soils.
  b. Podsol proper.
V. Soils of the Tundra type :
  a. Tundra soils.
  b. Mountain soils.
VI. Peat soils.
  a. Mountain peat lands.
VII. Laterites.
  a. Yellow earths.
  b. Brick earths.

ANDERSSON, Prof. GUNNAR. **The Different Types of Swedish Soils and their Distribution.** (Die schwedischen Bodentypen u. ihre Verbreitung). — *Verhandlungen der zweiten Internationalen Agrogeologenkonferenz*, pp. 331-339. Stockholm, 1911. 805

In this lecture, with which he inaugurated the work of the Second International Congress of Agrogeology, Professor Gunnar Andersson has been able to give, in few words, a very clear idea of the different soils of Sweden, their nature, and the method of their formation. The primitive crystalline rocks of the Scandinavian Peninsula are composed, for the most part, of gneiss and granites, and the silicates resulting from them in large quantities every year form a sufficient nutritive substratum for plant life. Nevertheless, an element which is particularly scarce is lime, this being explained by the small quantity of lime (0.5 to 1.5 %) contained in the parent rocks. On the other hand, potash, originating from potassic feldspars, abounds ; there is a good deal of phosphorus as

Sweden

well, owing to the uniform distribution of apatites in the fundamental crystalline nucleus.

In classifying soils according to their mode of formation, two great groups may be distinguished: the high mountain soils and those of the coast region.

1st Group. The only factor in the formation of the soil was supplied by weathering, which breaks up the most superficial part of the rocky substratum into blocks and sand; the blocks and sand are afterwards carried away by running water, and deposited at lower levels, where they form a good soil adapted especially for turning into pasture land.

Classical examples of this description of formation are found in the mountains of Nuolja, in northern Lapland.

2nd Group. Since the last great movement of upheaval, the rocky mass has naturally been exposed to the disintegrating action of weather factors. But with a yearly rainfall of 500 mm. maximum, the thickness of the weathered strata would not have exceeded 1 cm. in the rocks of finely granulated structure, and 2 cm. in less homogeneous rocks, if another powerful disintegrating factor had not intervened : the glacier.

Moraine Soils. These occupy the zone lying between the high mountain and the marine deposits, and having a width of about 124 miles; it extends from north Lapland down to Dalölf, over a length of more than 620 miles.

The depth of these soils is uniformly about 6 feet, and in some localities miles and miles can be traversed without perceiving a trace of the bed-rock. It is precisely with the idea of this stratum of marine soil in mind that it is customary to call Sweden the land of forests, *par excellence.*

River and Glacier Deposits. The combined action of erosion and abrasion has here and there formed, within the marine soil zone, strips of sandy soils, more rarely clayey, of very varying nature and structure : from coarse permeable soils, which are excellent for forests, to fine grained soils on which grazing lands predominate. These soils are very irregularly distributed. In the north, they are found at the bottom of the principal valleys; in the centre, their distribution is independent of local geographical conditions; in the south they again occupy rather the bottom of the valleys.

Marine Clays. Their extent coincides with that of the quaternary sea; a strip 50 to 100 kilometres (30 to 62 miles) in width skirts the whole of the Baltic, and another strip traverses the Southern part of Sweden directly, between the Baltic and the Skagerack.

These marine clay plains are not uniform; a large number of islands and peninsulas emerge, showing soils of different natures, moraine, sandy etc.

Peat Soils. At the end of the series of formations come the peat soils, which are scattered pretty well everywhere on any type of subsoil. They are a product of the rigorons northern climate, and have been gradually and continually formed during the entire post-glacial period.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY.

296

TUMIN, GRIGORIJ. **Preparation of Soil Charts.** (K Soglasovaniiu Rabot Potcvoviedov S Rabotami Agronomov i Statistikov). — *Xurnal Opetnoi Agronomii.* (Journal of Experimental Agriculture), God XII, Kniga 4, pp. 490-497. S. Peterburg, 1911.

The data supplied by soil investigators, scientific agriculturists and statisticians, regarding the productivity of a particular land, do not always perfectly harmonise. M. Tumin endeavours to explain the cause of this fact, and gives important indications as to the way in which soil charts should be prepared.

Russia

In charts showing the nature of the soil, distinct colours denote the zones of distribution of the different homogeneous soils. By the term homogeneous soil is meant those which have in the same degree the four following characteristics: 1) morphology; 2) mechanical composition; 3) chemical composition; 4) percentage of humus. On the other hand, no account is taken of the hydrothermic characters; it is assumed that their value is the same in all soils which are chemically, mechanically and morphologically homogeneous. This assertion however is not correct. Let us take for example the charts of the districts of Balascievk and Serdobsk; we distinguish a band of " black clay soil of finely granulated structure " which extends for 140 versts (93 miles) and is indicated by a single colour as a homogeneous soil, in spite of the notable variability of the hydrothermic conditions: in the northern part there is an average yearly rainfall of 500 mm. (20 in.), against 400 mm. (16 in.) in the south, and the contrast is brought out still more strongly by the gradual rise of temperature towards the south. These fluctuations of the climatic factor result in hydrothermic conditions (degree of moisture and temperature of the soil) differing from one place to another. These conditions were not directly checked in this case, but they can be gathered from statistical data. Thus, as the quantity of seed varied from 8 to 11 poods per dessiatine (100 to 150 lb. per acre) and the yield from 40 to 51 poods (530 to 680 lb.), statisticians were able to divide the said band of black earth into four zones following each other from north to south.

This example shows that the soils which, according to the indications of the charts, should be classified as identical, do not always present the same hydrothermic quality, and that it consequently becomes necessary to establish a second division of the land based on this new character.

There is however another factor which should not be left out of consideration, its importance being extreme, namely, man, who, by cultivation, manuring and choice of crops, acts on the soil and modifies its quality.

Systematic cultivation diminishes the quantity of humus by increasing its solubility and promoting its decomposition into ammoniacal salts and nitrates, and likewise influences the degree of humidity of the soil. The nature of the plants cultivated, which modifies the quality of the humus, results in a variation in the ratio of the important elements, such as nitrogen, phosphoric acid and potash.

Example : At the experimental Station of Plotcansksi it was observed that the growing of Gramineae impoverishes the soil in nitrogen, while Leguminosae consume a large quantity of phosphorus. In the Government of Vladimir there are lands poor in potash in the zone where potato and flax have been grown for a long time. Man modifies the physico-chemical and biological conditions of the soil in order to render it more productive, and farming methods, rotation and manuring aim at bringing a given soil into the highest possible condition of productivity.

The examination and classification of these different " growing lands " is also another task for the soil investigator ; this enquiry, in combination with the study of hydrothermic characters, may give soil charts the accuracy and practical value which they are still far from possessing.

CIAIANOV, S. K. **Humidity of the Soil in the Typical Steppe Lands and the Saline Lands of Columnar Structure in Relation to the Process of Formation of these Lands.** (Vlaxnosti Potevi na tipecnekh Potevakh Polupustini i Stolbciatekh Solonzakh v Sviasi s Voprosom o Khodie ikh Potcvoobrasavaniia). — *Xurnal Opetnoi Agronomii* (Journal of Experimental Agriculture), God. XII, Kniga 3, pp. 321-346. S, Peterburg, 1911. **297**

Russia

This work is the result of observations covering three years, on the course of humidity in the soil in the lands of the experimental Station of Temir, in the eastern part of the Ural Govt. The work is divided into three parts, the first part being devoted to a morphological, chemical and mechanical study of the soils in question, and a general survey of the conditions of the flora.

In the second part, M. Ciaianov gives particulars in relation to the course followed by the moisture in the various strata at different times. The samples of earth were taken at distances of 5 to 10 cm. (2 to 4 in.) down to a depth of 150 to 220 cm. (5 ft. to 7 ft. 3 in.).

In the third part M. Ciaianov sets out the analytical results in connection with the distribution of soluble salts and carbon dioxide in clay and sandy soils at different depths, and finally, from the comparative study of the mechanical composition, the structure, the disposition of the strata and the moisture, he takes occasion to deal briefly with the processes of formation of the soil in the typical steppe clays and the saline columnar lands.

From the considerations he adduces in this connection, it follows that the formation of the columnar saline soils in the elevated steppes assumes the character of superficial salt deposits ; these salt deposits are formed at the expense of the soluble salts which snow and rain gather from the atmosphere or which running water conveys from adjacent regions.

The principal results of this study may be summed up as follows·

1. In saline soils of columnar structure, the fluctuations in the degree of moisture are only perceptible to a depth of 40 cm. (16 in.).

2. In typical steppe soils on the other hand, these fluctuations occurred at all depths examined down to 150 cm. (5 ft.).

3. From the course of the moisture in the two types of soil and from examination of the strata, it appears that the soils of columnar structure always grow richer in salts, while the typical steppe clays tend to become continually impoverished.

298 LEMMERMANN, O., ASO, K., FISCHER H. and FRESENIUS, L. **Decomposition of Organic Substances in the Soil, Particularly under the Action of Lime.** Untersuchungen über die Zersetzung der Kohlenstoff-verbindungen verschiedener organischer Substanzen im Boden, speziell unter dem Einfluss von Kalk. — *Mitteil. der agr. chem. Versuchsstation Berlin. Institut für Versuchswesen u. Bakteriologie der Kgl. Landw. Hochschule Berlin.* — *Landw. Jahrbücher* Bd. XLI, H. 2, pp. 217-256. Berlin 1911.

Germany
Prussia

The authors begin by pointing out that an exact knowledge of the phenomena of decomposition of the combinations of carbon in the soil is nearly as important as that of the transformations of nitrogenous combinations. In relation to this they discuss the literature published on the question.

They have conducted two series of researches on the basis of pot experiments In a first series they ascertained the modifications undergone by the organic compounds of carbon by determining the amount of carbon dioxide given off; this method however presents two drawbacks:

1) the phenomena of decomposition may be accompanied by the formation of hydrocarbons;

2) carbon dioxide might be given off by the carbonates.

The authors therefore undertook a second series of investigations, in the course of which they exactly determined the loss and gain of organic carbon In the soil by determining it in the earth before and after the experiments.

From the results obtained the following are the main conclusions to be derived:

1. Both lime and carbonate of lime promote the decomposition of the organic substances in the soil, that is, the substances containing organic carbons;
2. The administration of kainite and superphosphate does not diminish this decomposition;
3. The depth at which the organic substance is buried is said to have no definite influence;
4. The decomposition of the organic substances is greater with green manure than with farm-yard manure;
5. Farmyard manure, left uncovered on the soil, does not undergo any less decomposition of the carbon combinations than when ploughed in;
6. With a mixed application of green manure and farmyard manure, no increase was found in the decomposition of the organic combinations of carbon.

299 HOFFMANN and HAMMER, B. W. **Some Factors Concerned in the Fixation of Nitrogen by Azotobacter.** — *Twenty-seventh Annual Report of the Agricultural Experiment Station of the University of Wisconsin*, pp. 155-172 + figs. 2 + tbl. IX. Madison, Wisc., 1911.

United States: Wisconsin

The maintenance of the nitrogen supply of the soil is, perhaps, the greatest problem with which the modern farmer must contend. Various biological factors aid materially in maintaining the nitrogen supply and also in offsetting the losses resulting from the ruthless waste of the same. Of these factors, the organisms that are able to fix free atmospheric nitrogen, independent of any host-plant, are perhaps the most interesting. It is, therefore, desirable to establish conditions in the soil that shall favour the growth of these organisms and the fixation of nitrogen by them. These conditions can be determined only after it has been found by detailed work in the laboratory what are the sources of energy open to the organisms; the various conditions that favour or retard their action; the elements other than carbon that are necessary and the form in which they are most easily utilized by the bacteria. The present paper is a contribution to this phase of the work.

The chief conclusions may be summed up as follows:

1. It appears that different soils vary widely in their power to fix atmospheric nitrogen, a range from 0.15 to 14.47 mgr. of nitrogen per gr. of mannit consumed having been obtained with the soils studied.

2. Mannit and lactose are to be regarded as the best sugars for maximum fixation in impure cultures. Maltose and sucrose in impure cultures give but light fixations. Under pure culture conditions, mannit and dextrin yielded the best results. Sucrose give a high degree of fixation with a pure culture. Lactose shows a lesser degree of fixation in pure, than in impure cultures.

3. Smaller quantities of carbohydrates in the culture solution tend to enhance the activity of *Azotobacter*. Where pure cultures are to be used for artificial soil inoculation, it is highly important that the cultures in question be as energetic and efficient as possible. This in an important factor to be considered when developing cultures for such purposes.

4. Bi- and tricalcium phosphates give better results as regards fixation than the monosalt.

5. In determining the coefficient of nitrogen fixation of any soil it is important to consider the period of incubation. If it is too long, losses in the nitrogen fixed will result. From the results

obtained it would seem that the period of incubation for impure cultures should range from 14 to 28 days.

6. Calcium carbonate need only be present in very small quantities.

7. For abundant development in pure culture when grown in liquid media, the use of a quartz sand slope has proven very efficient.

8. The protein as well as the phosphorus content of the cells of *Azotobacter* are influenced by the age of the cultures.

800 STOKLASA J. **The Importance and the Determination of the Intensity of Respiration of Bacteria in the Soil.** (Methoden zur Bestimmung der Atmungsintensität der Bakterien im Boden). — *Zeitschrift für das landwirtschaftliche Versuchswesen in Oesterreich,* XIV. J., H. II, pp. 1243-1279 + tabl. I-II. Wien, November 1911. (1)

Austria

In summing up the principal results obtained hitherto by the Author in his present researches, which form the continuation of those in which he previously studied, under different aspects, the phenomenon of the respiration of bacteria in the soil, it is first and foremost proved that the intensity of respiration of micro-organisms in the soil plays an important part. It is moreover dependent not only on the treatment of the soil, *i. e.* on the fact of the latter being well or badly ploughed, manured and cultivated, but likewise on the plants grown. Thus the respiratory energy of the micro-organisms in a field of sugar beets is greater than that of the micro-organisms in a three year clover field. Furthermore, in all cases, the air contents of the soil are directly related to the intensity of respiration of the bacteria.

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(1) Other sources: J. STOKLASA: 1) Ueber den Ursprung, die Menge und die Bedeutung des Kohlendioxyds im Boden, *Zentralblatt für Bakteriologie,* etc. XIV, II. — 2) Ueber die Wirkung des Stallmistes, *Zeitschrift f. d. landw. Versuchswesen in Oesterreich,* X. — 3) Beitrag zur Kenntniss der Stickstoffanreichung des Bodens durch Bakterien und ihre Bedeutung für die Pflanzenernährung, *Deutsche landwirtschaftliche Presse,* XXXV. — 4) Methoden zur Bestimmung der Exkrete bei der Atmung der Bakterienzelle, *Abderhaldens Handbuch der biochemischen Methoden.* — 5) Biochemischer Kreislauf des Phosphations im Boden, Jena 1911.

After first sterilising and then inoculating with equal quantities of bacteria of the same virulence, the author was able to determine, according to the quantity of carbon-dioxide exhaled, the power of decomposition of the organic substances in the soil. It would appear that the principle which must be made the basis for judging the biological activity of bacteria is not the quantity of inorganic substances present in the soil, but the intensity of respiration of the bacteria. This intensity would show the presence in the soil not only of active bacteria but also of easily decomposed organic substances.

The chemical composition of the drainage waters may also supply a basis for gauging the intensity of the bio-chemical phenomena in a soil. The significance attaching to the quantity of bicarbonate of lime is of quite a special character; this quantity is noteworthy in drainage waters coming from soils where bacterial activity is great, even if these soils only contain small quantities of lime, while drainage waters from lands rich in lime but where bacterial activity is feeble, are relatively poor in bicarbonate of lime. Generally, therefore, there is a relation between the bacterial activity of a soil, the quantity of carbon-dioxide exhaled and the quantities of bicarbonate of lime found in the drainage waters.

All this confirms the fact that the determination of the carbon-dioxide exhaled by a soil constitutes a reliable method for ascertaining the transforming energy of the autotrophic and heterotrophic bacteria of this soil (autotrophic organisms are those feeding exclusively on the inorganic substances of the soil and heterotrophic those which must obtain their substances from autotrophic organisms). The amount of carbon-dioxide produced by a given quantity of soil in a specified time, at a fixed temperature and with an ascertained degree of moisture, represents exactly the measure and development of physiological combustion and enables a comparison to be made of bacterial work in different soils.

Very great is the influence of the different factors of vegetation on the intensity of respiration of different bacteria.

1. Air or water capacity of the soil.
2. Properties and quantities of decomposable organic substances in the soil, particularly hydrocarbons.
3. The presence of organic and inorganic nitrogenous substances and of easily assimilated nutritious substances containing phosphorus, potash, etc.
4. The number of autotrophic and heterotrophic bacteria.
5. The chemical reaction of the soil.

Thus it makes a great difference whether the soil is damp, rich in humus or colloidal clay, with acid character; or dry, with readily assimilable nitrogen, phosphorus and potassium combined with humus, and a neutral or slightly alkaline reaction. In point of fact, in the latter case the growth of the bacteria takes place in the most desirable way and their respiration is most active, owing to an abundant air supply. It is also exceedingly important that the bacteria should have at their disposal, in addition to nitrogen, a plentiful supply of phosphorus, sulphur, chlorine, potash, soda, magnesia, lime, iron, alumina and manganese; iron and manganese cannot be assimilated to advantage by autotrophic and heterotrophic bacteria if alumina is wanting.

Furthermore, as to nitrogen, the forms are not equivalent; thus, in forest, grass land, field or garden soil, the predominance is observed of bacteria assimilating by preference organic nitrogen, ammoniacal nitrogen or nitric nitrogen as the case may be. Bacterial respiration, in fact, is intensified in a different degree by the different nitrogenous substances according to the character of the bacteria living in the corresponding soil. Thus, in soils where bacterial activity is feeble, the nitric form is the most advantageous; if the production of carbon-dioxide is increased by the application of monocalcic phosphate and chloride of potash, this is a sign that the phosphate and potash ions are in the soil in a non-assimilable form; similarly deductions may be made of great practical importance regarding other fertilising substances, such as lime and magnesia.

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION.

801 LABERGERIE. **Agricultural Improvements in France.** — *Journal d'Agriculture Pratique.* 75e année, No. 1, pp. 16-18. Paris, 4 Janvier, 1912.

France

In France the Hydraulics Service began to work in 1865; it kept itself at first to the more extensive undertakings such as draining and cultivating the Landes (800 000 ha. = 1 976 000 acres), Sologne (500 000 ha. = 1 235 000 acres), Dombes (112 000 ha. = 276 000 acres) etc., the draining and reclaiming of the marshes of Fos and the lake of Arnel in the South, and the creation of irrigation canals in several departments of the South.

In 1903 the service for Agricultural Improvements and the Hydraulics Service were amalgamated with the special view of draining the damp soils of valleys (regularisation of water-courses, drainage, excavation of ditches, etc.) and plateaux without natural outlet (drainage, ditches, pumping-stations, etc.), of utilising water-falls for the production of power, generated in the form of electricity (light, mechanical power, pumping of water for irrigation or drinking purposes, etc.); of the improvement of country roads, etc.

These various branches of work are executed by syndicates of land owners. If it be a question of protection against the sea, rivers or torrents, of forest or " landes " fires, of cleansing or deepening water courses and canals, of drying marshes and draining damp, unhealthy soil, it is necessary before undertaking the work, to secure the co-operation of a majority of those interested representing at least two thirds of the property or of at least two-thirds of those representing more than a half of the total area.

In questions of irrigation, warping, drainage, making occupation roads, or any other improvement of common interest, the consent of the owners of three quarters of the area and paying more than three quarters of the landed property tax, is necessary.

At the present time, the amount contributed by the State for this work is not sufficient to solve the question of utilising atmospheric forces for the production of electric power.

These latter works, which are increasingly adopted in Denmark, might be advantageonsly introduced in France, for, apart from the question of definite advantage to be extracted from the utilisation of a natural force at present wasted, it would result in substituting windmillls to hydraulic motors and consequently doing away with many little waterfalls, and the reservoirs regulating them, the upkeep of which prevents the drainage and cultivation of considerable extents of surface in the valleys where they are found

The Hydraulics and Agricultural Improvement Service not only undertakes work affecting the common interest, by uniting a certain number of proprietors in the form of syndicates, but also superintends private enterprise. In the latter case, preliminary surveys and superintendance of the work are given gratuitously; while the former receive financial assistance to the extent of even a third of the expenses as estimated by the engineers of the Service.

Plans and estimates are always submitted beforehand to those concerned, who are free to have them executed or not according as the expenses to be incurred exceed or otherwise the resources at their disposal.

802 **Irrigation Investigations in the United States.** — *Annual Report of the Office of Experiment Stations for the Year ended June 30th, 1910*, pp. 37-43. Washington, 1911.

United States

For a number of years after its establishment, the Irrigation Division of the Office of Experiment Stations of the United States had its two chief centres at Cheyenne, as representing the States of the Rocky Mountains; and Berkeley those of the Pacific Coast.

This organisation. necessitated too much travel, and was altered three years ago by Dr. Fortier. Ten State agencies have been appointed in the arid region and agents are to be appointed in the other Western States.

The new organisation is excellent, for as agents live in the heart of the district it is their business to improve, it is easier for them to understand what kind of work to undertake.

The following statement gives the description of the work effected in the principal regions.

1. *California.* — A piece of land of about 15 acres was put at the disposal of the Service by the University Farm at Davis; it has been utilised for experiments in irrigating alfalfa, wheat and corn.

2. *Washington.* — At the Station of Sunnyside experiments are chiefly made regarding the loss of water by evaporation.

3. *Idaho.* — On a farm of 40 acres at Gooding, investigations were made as to the effect of different quantities of water on alfalfa, grain and other crops.

4. *Nevada.* — Makes a special study of the amount of evaporation arising from irrigated soil and the influence of irrigation on grain and alfalfa.

5. *Utah.* — Researches here are eminently scientific; studies are being carried on as to the movements of water in the soil, by means of variable quantities of water, at different times and applied with different methods of cultivation.

Besides this, sugar-beets have been irrigated with the result of increasing the sugar-content by 2 1 %.

In peach orchards, it was found that the most rapid growth of the tree and the stone is made in the fore part of the season, while that of the peach is made in the last part of the season, and liberal applications of water in late summer resulted in large yields.

6. *Arizona.* — The Station has given practical advice to farmers, especially in the installation of pumping plants, it has published a Farmers' Bulletin on the use of wind mills in irrigation.

7. *New Mexico.* — Here too the subject of mechanical irrig-

ation is studied as well as phenomena of evaporation and the loss of water in irrigated soil.

The part played by the Agent at the Station is eminently educative; he does all in his power to have the defective systems hitherto in use given up in favour of more rational methods.

8. *Colorado.* — At Eads, on a farm of 40 acres comparisons are made between " dry-farming " and irrigation, and the use of small supplies of water to supplement dry-farming.

At Rockyford comparisons have been made with different methods of irrlgating sugar-beets.

9. *Wyoming.* — Two farms serve as experimental stations; one at Cheyenne, the other at Newcastle. Irrigation and dry farming are studied simultaneously as well as different types of windmills.

Two publications have been issued regarding the results of experiments made at these stations.

10. *Montana.* — Experiments in losses by evaporation are the main subjects of investigation.

11. *North-Dakota.* - Experiments similar to the preceding.

12. *Kansas.* — Half the irrigation is effected by mechanical means; with sandy soils, small applications at frequent intervals seem to give the best results.

13. *Texas.* — Pumping-plants are largely employed. Attempts are being made to reform the wasteful methods hitherto in vogue.

Irrigation of Rice. — Experiments are being carried on in the rice districts of the South.

The ravages of the boll weevil have made the growing of cotton less profitable than formerly and the farmers are turning to rice growing; but they are usually quite unfamiliar with the pumping plants, etc., required.

Irrigation in Humid Sections. — This is effected in the East and South, in time of drought, for the cultivation of vegetables and fruit. In Florida irrigation generally takes places in winter when the rainfall is lowest.

Irrigation along the Negro-River. — *Bulletin of the Pan American Union,* No. 5, Vol. 33, p. 996. Washington, November, 1911. **908**

The Southern Railway, acting in conjunction with the bureau of immigration of the Argentine Republic, has amplified its plan for the irrigation of lands lying along and adjacent to the Rio Negro. **Argentina**

The plans include the irrigation of the whole valley of the Rio Negro between Chinchinales and Cipolleti stations, as well as the highlands in the neighbourhood of the river valley. About 40 000 hectares (98 800 acres) of fine Government lands near the town of Poca will in this way be brought under cultivation, and the lands will be disposed of to actual settlers on very advantageous terms.

TILLAGE AND METHODS OF CULTIVATION.

804 LÉGIER, EM. **Methods of Cultivation and Irrigation in Spain.** (Méthodes culturales et irrigations en Espagne. *La Sucrerie indigène et coloniale*, 48ᵉ Année, No. 1, pp. 1-3. Paris, 2 Janvier 1912.

Spain

The climate of Spain varies within very wide limits; very hot and very dry summers, very severe winters with snow on the mountains and a little rain in the valleys. This rain, owing to the absence of vegetation, has for a long time furrowed the arable soil and conveyed it into the thalweg of the water-courses.

The method of cultivation adapted to such climatic conditions consists in the creation of successive terraces The surface of each terrace is made horizontal by bringing up earth from the lower part. Small ridges are formed, projecting slightly above the surface of the ground, and all sowing is carried out on these ridges.

The terraces are watered from a main channel fed by the water impounded by a dam, generally built of masonry, with the arch directed upstream.

From the main channel, distributing channels start, running perpendicularly to the direction of the ridges.

In each field, sowing is effected by the drill, which immediately follows the ridging plough. For winter cereals the lines are rather close, and when sowing is completed the bottom of the furrows is covered with water so as to wet the seeds. The water is then stopped.

For beets the process is the same, and when the seed has sprouted, water is let in every week. Under these conditions very clean roots are obtained, of an average weight of 800 to 900 grammes (1 3/4 to 2 lb.).

The average yield is 25 tons per hectare (10 tons per acre); with care 40 tons (16 tons per acre) are sometimes secured. The sugar content rarely exceeds 15 %.

On the terraces, the first ploughings are carried out very simply by a primitive plough drawn by two mules.

805 KERPELY, KALMAN. **Deep Drilling.** (Sülyesztett sorvetés.). — *Köztelek*, XXI Year, No. 101 (2071), pp. 3261-3264. Budapest, December 23, 1911.

Hungary

Results of experiments in deep drilling made by M. Kerpely, director of the Agricultural Academy of Debreczen, by means of the Zehetmayr Drill.

In front of the tubes of the drill, 6 1/2 inches apart are fixed coulters which make tracks 1 1/2 to 3 1/2 inches in depth. The tubes send the grain to the botton of the furrows, where small double cylinders, in the form of truncated cones, press down the soil over the grain, at the same time throwing up ridges of earth between the lines.

Consequently the plant germinates at the bottom of the furrow between these banks of earth; later on, when it has sent out three or four leaves the soil must be gone over with a Zehetmayr toothed harrow to level the ridges and bury the stems of the young plants The object of this method of treatment is to oblige the plant, by burying part of the stem, to form stronger and more ramified roots and to tiller better, so as eventually to give a heavier yield.

According to the author, such experiments prove that this method of treatment, applied to the culture of winter wheat, cannot produce better results than those obtained by the usual method of drills 5 inches apart, *i. e.* an increase of 1 1/4 to 3 1/4 cwt. per acre. This is especially the case in Hungary where the climate is unusually dry and the temperature rises rapidly in spring, thereby preventing the plant from reaping all the advantages of the greater distance between the drills.

But as applied to the culture of winter rye, this method gives more satisfactory results, *i. e.* a heavier yield, 2 1/2 to 3 1/4 cwt. of grain and from 3/4 to 1 1/2 cwt. of straw more per acre than can be obtained by the use of the ordinary drill.

Of course experiments of only two years' duration are insufficient to determine definitely the value of the above-mentioned method and they must also be continued in other regions, where climatic conditious are unlike those of Lower Hungary.

806 LÉGIER, EM. **Methods of Cultivation in the Domain of Uladowka, Russia.** (Les méthodes culturales dans le domaine d'Uladowka. en Russie). — *La Sucrerie indigène et coloniale,* 47ᵉ Année, T. LXXVIII, No. 25, pp. 575-581. Paris, 19 Décembre 1911.

The domain of Uladowka is an irregular oblong, 26 km. (16 miles) in length, 6.5 km. (4 miles) in breadth, with an area of 8 464 ha. (20 916 ac.) distributed as follows:

Arable Land	4 097 ha.	(10 124 ac.)
Woods.	3 318 »	(8 199 »)
Meadows	583 »	(1 440 »)
Uncoltivated and buildings.	466 »	(1 152 »)

Russia

The domain is exposed to the continental climate characterised by abrupt changes of season, long autumns, the rapid passing of winter into summer, with an almost complete absence of spring. The amount of rainfall in summer, between June and September, reaches 219 mm. (8.6 in.) which is half the annual fall: thus care is taken to avoid methods likely to promote evaporation.

Five different systems of rotat on are used:

	10 year	10 year	9 year	8 year	8 year
1st year.	Beets	Beets	Wheat	Beets	Wheat
2nd »	Barley	Peas	Beets	Peas	Beet seed
3rd »	Clover	Wheat	Barley	Wheat	Barley
4th »	Beet seed	Barley	Clover	Clover	Clover
5th »	Wheat	Clover	Beet seed	Beets	Clover
6th »	Beets	Clover	Wheat	Buckwheat	Wheat
7th »	Peas	Wheat	Beets	Rye	Oats
8th »	Wheat	Beet seed	Oats	Fallow	Peas
9th »	Oats	Oats	Fallow	—	—
10th »	Fallow	Fallow	—	—	—

In the case of the 10 year rotation the beets are dunged and the clover is sown under the cereals. Dung is only used twice during this long period, but chemical or other manures are given to the crops. Those used are:

1. Fallows are sown with lupins which are ploughed under before winter.

2. Dung is spread before winter at about 32 tons per acre; about 500 tons a year of chicken guano is used.

3. Superphosphate of bones, enriched with potash by means of molasses dregs, at 2 3/4 cwt. per acre.

4. 40 % chloride of potash at the rate of half a hundredweight per acre.

5. Wood-ashes. The domain possesses a sugar-factory where wood is burnt in low-pressure generators. The composition of the ashes obtained is as follows:

Phosphoric acid	3.10 %
Potash	8.05 »
Lime	30.21 »
Water	5.03 »

6. The dregs from a distillery built on the domain. These dregs are employed in irrigation.

7. Quick-lime, which after having been kept in pits during the winter, is put on in spring.

The treatment of the soil naturally varies according to the crops following the fallow. The Author investigates the two cases of beets and winter wheat.

1. *Beets.* — The fallow sown with lupins is dunged and ploughed to a depth of 4 inches in April or May. The following winter it is ploughed a second time to a depth of 10 inches; it is subsequently harrowed in spring and spring-cultivated to a depth of 14 inches. The soil is then levelled by means of a simple wooden frame drawn over the field; then rolled with a wooden roller; the beets are sown at the same time as the chemical manures with a combined drill, and finally the iron roller is used.

2. *Winter Cereals.* — The same method is used, except that the harrowing and subsequent operations are done before winter so as to be able to sow the corn in August.

The New Dehne drill is generally employed, which leaves two empty rows to every three, so as to allow horse-hoeing.

Ploughing for spring sowing is done in autumn; deep winter ploughing is no longer used, in order to preserve the amount of moisture necessary to the soil.

The results obtained per acre are as follows.

Winter wheat and barley	21 cwt.
Sugar beets	10 ½ tons.
Oats	24 to 27 cwt.
Peas	17 to 21 cwt.
Clover (seed)	4 to 5 ½ cwt.
Beet seed	14 ½ to 16 cwt.

807 POUDRET, F. (Director of the Preserve Factory at Kerzers, Switzerland). **Peat Soil in Switzerland. Results obtained by Growing Peas in reclaimed Peat-Soil.** — *La Terre Vaudoise*, 3e Année, No. 52, pp. 470-473. Lausanne, 30 Décembre, 1911.

Switzerland

Peat soils are veritable mines of humus, rich in nitrogenous bodies. They were for long unrecognised and despised as improductive; and in fact, in spite of containing a superabundance of nourishment for plants, they have been more a source of failure than of success to the farmer who attempted to utilise them.

These soils are rich in nitrogen, which, however, cannot be assimilated by plants on account of the acidity of the soil, produced by long saturation with water and lack of aeration. Hence the failures experienced by agriculturists when attempting to cultivate these kinds of soil, till the time when by employment of suitable chemical manures their acidity was neutralised, the nitrification of the humus in them effected, and their abundance of nitrogen rendered easy of assimilation by plants.

The employment of chemical manures was therefore the starting point in converting marsh-land into cultivable soil.

For many years lime was considered to be the necessary and only means of improving peaty soil; but Prof. Dumont, of the National School of Agriculture at Grignon has demonstrated the importance of potash in the nitrification of soils rich in humus, and in rendering the nitrogen capable of assimilation. His conclusive experiments have resulted in more decided steps being taken to reclaim these soils and it is a fact that the area of peat land reclaimed for agriculture is continually increasing.

The conversion of peaty soils into arable land consists of two operations:

1. A rational drainage of the soil.
2. The neutralisation of its acidity and the nitrification of the humns it contains by the application of chemical manures, especially potash.

By this means poor fields of sedges and rushes can be converted into profitable market-gardens.

Though these soils are well suited to vegetable-growing the superabundance of humus prevents their use for field crops; cereals yield great crops of straw, but little grain, and that of poor quality. Phosphatic manure may reduce this tendency, but only to a limited extent.

In peaty soil, there is already so much humus present, that gardeners may economize dung, and confine themselves to chemicals consisting chiefly of potash and phosphoric acid. During the seven years that **M.** Poudret has been growing vegetables on his 80 " poses " (71 acres) of marsh-land (1), he has never once used dung, finding chemical food amply sufficient for his purpose, always giving abundant crops. In market gardening on peat soil he reckons he has saved £6 worth of manure per " pose " by using only chemicals.

It is evident therefore that reclaimed peat soil is specially adapted for vegetable-growing and with this fact in mind, Mr Poudret remarks that the Swiss would do well to exert themselves in developing this branch of agriculture. As a matter of fact the importation of vegetables into Switzerland is constantly increasing. Even in 1906 it reached the sum of 8 400 000 francs. In that year Germany sent 283 336 quintals (28 000 tons), France 104 652 (10 300 tons) and Italy 50 472 (nearly 5 000 tons). The author specially notices the German importations, as the vegetables are all of a kind that might easily be cultived in Switzerland ; they do not come under the heading of early vegetables. Swiss-grown vegetables might easily take the place on the markets of those sent from Germany. It is rather curious to notice that the enormous increase in hotel-keeping all over Switzerland has done little in the way of encouraging vegetable-growing.

The factories of cheap briquettes which have lately sprung up, not only spoil this marsh land but are of very little profit to the country. It is a soil which should be entirely given up to agriculture; for this kind of exploitation is likely to be of the greatest advantage to the country as a whole.

In the month of February, 1911 the Author leased from a neighbouring commune a number of uncultivated marshes covering 43 Freiburg " poses " (35 acres). The land was not drained and yielded nothing but a few cartloads of sedge. As the peasants despised it, it was left on the hands of the Commune whose only means of turning it to account was selling the peat as litter.

By March the Author had already seen everything in working order for ploughing as much as possible of this peat-soil, which he had previously had drained by means of four large ditches. Before the moment for the spring sowing arrived, 18 " poses " out of the 43 of which the land was composed, had been successfully worked. The ploughing was effected under great difficulties, coarse sacking having to be fastened onto the horses' shoes, on more than one occasion, to prevent them from sinking too deeply into the swamp soil.

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(1) This refers to the Freiburg " pose " of 143 poles (36 ares). (*Ed.*).

Out of the 18 tilled " poses " 14 were sown with different varieties of peas, in order to make a comparative study of them; these were: Merveille d'Amérique, Abondance, Monopol, Folger, Serpette and Caractacus.

From the very beginning the peas were remarkable for their wonderful vegetation. The crop of peas was also very fine showing how productive a marsh may become when subjected to a rational treatment of chemical manures.

Certain sections, such as the one sown with Abundance, produced as much as 15 850 kg. per ha. (126 cwt. per ac.). These yields were obtained in large areas.

The total crop of peas in pods was 46 762 kg. (920 cwt.), and was sold at the Preserve factory of Kerzers (Chiètres) at 9 718 francs (£385.5*s*). To the above sum must be added 2 300 francs (£91.4*s*) for 2 727 kilos (53 3/4 cwt.), of seed gathered, and 360 francs (£14.[illegible]) for the sale of pea-straw. The seed are valued considerably below the actual price, in order to give ample allowance for waste in cleaning them.

Thus on 14 " poses " of peas the gross revenue is 12 378 fr. (£490.14*s*), or 884 fr, per Freiburg " pose " (£39.6*s* 3*d* per acre)

The cost of the cultivation and harvesting of these 14 " poses " 2 acres) of peas was as follows:

			Reduced to per acre £	s.	d.
Preparation of the ground at 20 fr per pose	Fr.	280	—.	17.	9.
Seed (829 kg., — 16 ¼ cwt.)	»	1 090	3.	9.	4.
Potash salt, 40 % (2 800 kg., — 55 cwt.)	»	370	1.	3.	3.
Basic slag, 16 % (4 200 kg., — 83 cwt.)	»	244	—.	15.	6.
Sowing and interculture	»	745	2.	7.	4.
Nicotinised sulphur (200 kg., — 4 cwt.)	»	65	—.	4.	1.
Picking	»	3 654	11.	12.	1.
Carting of pea-haulm	»	65	—.	4.	1.
Thrashing of pea-seed	»	310	1.	0.	3.
Rent, at 40 fr. per pose	»	560	1.	15.	7.
Total expenses	Fr.	7 392	23.	9.	7.
Net return: 12 378 — 7 392 =	Fr	4 986	£15.	16.	9.

This most satisfactory harvest, must be regarded as rather exceptional, the present year having been particularly favourable to the growing of marsh-grown vegetables.

MANURES AND MANURING.

808 GROSSMANN, H. **The Nitrogen Question.** (Die Stickstofffrage und ihre Bedeutung für deutsche Volkswirtschaft). — *Schriften des Verbandes Deutscher Diplom. Ingenieure*, VIII, pp. 65 + tbl. X Berlin, 1911.

Germany

This is a general review of present conditions and the probable future of the various nitrogenous products on the international market.

The first important question is as to the potentialities of the Chilian Nitrate deposits. The pessimistic opinion which gained ground at the close of the 19th century has indirectly had the happy result of stimulating the artificial manufacture of new nitrogenous products, but the increase of production of these latter and the decline of the prices for nitrate of soda, have modified this pessimistic opinion; so much so that it is now thought that the Chilian deposits will suffice for all requirements during several generations. According to the estimate of the Chilian Government, there is a reserve of 340 000 000 tons in deposits where extraction is easy, which would suffice to ensure an annual output of 2 500 000 tons for a period of 136 years at least, calculating that in 1910 the world's consumption amounted to a maximum of 2 240 000 tons.

In brief, on the basis of the data in our possession, the following anticipations may be regarded as the most probable:

1. The deposits of Chilian nitrate are in reality more extensive than the first geological estimates had suggested ; in any case they will suffice for at least 100 to 150 years. Whatever the view taken, under present circumstances it is impossible to fix a specific date for their exhaustion

2. This being premised, what is known as the Nitrogen question does not seem to assume that character of urgency and gravity for the civilised world which is or was commonly attributed to it. Nevertheless it should not be concealed that this question might enter upon an acute phase for subsequent generations, unless the processes of fixation of atmospheric nitrogen are in the meantime improved in the effective way which the results already secured justify us in expecting.

3. Contrary to the forecasts which had been made, the price of nitrate of soda has fallen off notably during the past three years, and it may be expected that in the future this important product of the international market will be subject to lesser or greater fluctuations in price, like coal, cereals, oils, rubber, metals, etc.

If we next consider the artificial sources of nitrogen, we must deal first of all with those based on the fixation of atmospheric nitrogen by electric energy, nitrate of lime or Norwegian nitrate, and calcium cyanamide or lime-nitrogen. At present these productions require cheap hydraulic power. From this point of view and under present conditions, it is still true, as was anticipated by Mr N. O. Witt, that the total of waterfalls in Europe are far from being sufficient to cover the world's consumption of nitrogen.

In regard to the three processes under .consideration for the production of nitric acid and nitrate of soda respectively from atmospheric nitrogen, the following units of yield have been given:

	Grammes of nitric acid per kilowatt-hour
Birkeland and Eyde	70
Schönherr	75
Pauling	60

In any case, at the present time the production may be regarded as established on a solid basis in Norway, which exported in 1910, 13 140 tons of nitrate, the output of the country being estimated at 20 000 tons. It must be taken into account however that part of the nitrogen is utilised in the form of nitrites, the production of which for industrial purposes has assumed remarkable proportions.

With regard to calcium cyanamide and its derivatives, the author deplores the absence of precise information both as to the quantity of production and the producing capacity of the different centres.

Another nitrogenous industrial product the output and consumption of which have more than quintupled during the last twenty years is sulphate of ammonia, the production of which does not depend on a plentiful supply of hydraulic energy, but which chiefly represents an important by-product of the modern use of fuel, particularly coal and peat. Coal, for instance, contains an average of 1 kg. of nitrogen in combination per quintal (= 1 %), of which at most 8 to 10 gms. (0.08 to 0.10 %) are utilised. There consequently remains a wide margin for subsequent production, but it must not be forgottem that this production is subject to great fluctuations closely connected with the crises in the coal industry.

Latterly the Mond-Frank-Caro process has been introduced (in Germany, England and Italy) for the utilisation of the nitrogen contained in peat. This process would allow of the extraction of 40 to 80 kg. of sulphate of ammonia from 1 ton of peat (= 4 to 8 %), and it is said to have been calculated, for instance, that the 2 000 000 ha. (5 000 000 ac.) of peat moors existing in Germany would suffice to supply its nitrogen requirements for 2000 years. But these calculations must at present be regarded as highly optimistic.

There are in existence other processes for the preparation of ammonia by means of atmospheric nitrogen, partially from peat on the method of Woltereck, or wholly by catalysing agents; or again, by nitrites, especially nitrites of alumina. These processes, however, have not yet emerged from the experimental stage, and any predictions as to the putting on the market of synthetic ammoniacal products would at the present moment be premature.

However this may be, the world's production of sulphate of ammonia in 1910 amounted to 1 100 000 tons, being 369 000 in Germany, 363 000 in England, 114 000 in the United States and 100000 in Austria-Hungary ; the rest was divided amongst France, Belgium, Italy and other countries

In conclusion, it may be held with the author that for German husbandry in particular, and that of all civilised countries in general, there still exists a margin of increase for the supply of mineral and artificial nitrogenous fertilisers at suitable prices, at least for the immediate future ; and the late apprehension of a nitrogen crisis has lost much of its justification in consequence of technical development and the discovery of fresh sources of nitrogen. Notwithstanding this, a definitive judgment cannot for the moment be passed on the new products, particularly on Norwegian nitrate and calcium cyanamide, these industries being still in process of development. Therefore the well grounded hope may be indulged that even in the contingency of future exhaustion of the Chilian nitrate deposits, the agricultural and the civilised world will not need to suffer from a shortage of combined nitrogen.

A good bibliography on this important question concludes this study, 809 Stewart, R. **The Occurrence of Potassium in Western America.** (Contribution from the Chemical Laboratory, Utah Experiment Station). — *The Journal of the American Chemical Society*, Vol. XXXIII., No. 12, pp. 1952-1954 + tbl. 1. Easton, Pa., December, 1911.

United States

A deposit of potassium nitrate was discovered in Southern Idaho. This deposit was examined by the author, and was found to be in a cave occuring in red sandstone, near to large deposits of sodium chloride. The position of the deposit and the nature of the surrounding country indicated that the nitrate could have been carried only through the sandstone by percolating water, precluding the possibility of its recent formation by bacterial action. The results of the analysis show that the material is crude potassium nitrate with some calcium sulphate, containing 30.89 - 35.06 per cent. of potassium, and 11.12 - 12.79 per cent. of nitric nitrogen. Deposits of nitrates have been reported elsewhere in Western America, and samples have been received at the Utah Experiment Station.

Although the nitrate has not been found in quantities of commercial importance, the fact that it does occur in sandstone deposits is of interest just now for two reasons. It may indicate that water-soluble potassium occurs in quantities of commercial importance in the arid western America.

It may have also some bearing on the recent discovery that nitrates are the predominating constituents in some of the western American soils impregnated with alkali. The occurrence of these nitrates has been attributed to their formation by bacterial action at the present time. The existence of deposits of nitrates in the country rock in widely distributed areas in the arid western America may have some connection with the occurrence of excessive quantities of nitrates in those agricultural soils.

810 Lemmermann, O., Blanck, E., Heinitz, B. and v. Wlodeck, J. **The Behaviour of Ammoniacal Nitrogen in Limed and Unlimed Soils.** (Untersuchungen über das Verhalten des Ammoniakstickstoffs in gekalkten und ungekalkten Böden. — Mitteilungen der agrikulturchemischen Versuchsstation Berlin, Institut für Versuchswesen und Bakteriologie der Kgl. Landw. Hochschule, Berlin). — *Landwirtschaftliche Jahrbücher*, XLI. B., H. 2., pp. 163-216. Berlin, 1911.

Germany

These are experiments in pots sunk in the ground, in which a sandy loam soil was treated with different proportions of limestone and sulphate of ammonia.

The principal results may be summed up as follows:

1. In a soil containing 92.21 % of sand and 4.13 % of clay, the addition of 1 % of carbonate of lime resulted in a loss of nitrogen, due perhaps to the sulphate of ammonia which was added directly after the lime. Nevertheless with a smaller quantity of lime (0.60 % of carbonate of lime) and sulphate of ammonia, the loss of nitrogen was perceptibly less, so that, keeping to the proportions and rules customary in farming practice, no great losses of nitrogen by volatilisation need be feared.

2. In the limed soil, the greater portion of the ammoniacal nitrogen added is converted within 42 days into nitric and albuminoid nitrogens, a small part only remaining unchanged.

3. With a heavy dressing (1 % of carbonate of lime and 0.0396 % of nitrogen as ammonia), the losses of nitrogen diminish with the increase of clay-content and of water-absorbing power. If the sulphate of ammonia is mixed with superphospate, the losses of nitrogen subsequently fall off, and in certain cases do not occur at all.

4. In soil containing 15.5 % of clay and 84.5 % of sand (1), and also in one containing 5 % of clay and 95 % of sand, a dressing of lime at 0.6 % of carbonate of lime, followed five weeks later by an application of sulphate of ammonia at 0.010 % of nitrogen, produced no loss of nitrogen.

5. If the lime contents of the soil amount to 1.2 % of carbonate of lime, or if sulphate of ammonia is added at 0.020 % of nitrogen, losses of nitrogen take place.

6. If nitrogen is put down in the form of ammoniacal superphosphate the losses of nitrogen are greatly reduced.

7. Deep digging in of the sulphate of ammonia also exerts a favourable effect on the preservation of the nitrogen in the soil.

8. In view of the high proportions of sulphate of ammonia used in the experiments in question, it must be concluded that in soils containing not more than 0.6 % of limestone no volatilisation of the ammonia need be feared, if the sulphate of ammonia has been thoronghly mixed with the soil.

9. With a content of 0.6 % of limestone, it would seem that sulphate of ammonia is more nitrified in light soils, while in heavy

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(1) "Clay" is used as a translation of "abschlämmbare Teile" *i. e.* the fraction remaining after sedimentation; "sand" therefore refers to all the other fractions. (*Ed.*).

soils it appears to be chiefly converted into protein. These results' which are of considerable importance, require confirmation by subsequent experiments.

10. When the same sandy loam was left untreated for 77 days, contents of total ammoniacal, nitric and organic nitrogen showed very little change.

11. In a soil with 0.14 % of lime, without any further addition of limestone, no loss of nitrogen occurs, even after a heavy dressing of sulphate of ammonia.

12. With a higher content of lime or a larger dressing there is not always a corresponding loss of nitrogen by volatilisation of the ammonia, as for instance when nitrification or the formation of albumen is so much encouraged by the higher lime contents, that the volatilisation of ammonia is prevented.

13. The greater the absorptive and nitrifying power of a soil, the smaller will be the losses by volatilisation of ammonia, other conditions being, equal.

These results are of great practical importance, for they tend to show that under ordinary, pratical farming conditions, the dangers of volatilisation of ammonia are not so great as many believe. Moreover these results are confirmed in their main outlines by a recent work of P. Ehrenberg (1).

811 Chavan, P **Influence of Phosphates and Potash on the Composition of Meadow Grass.** (Influence de la fumure phosphatée et potassique sur la composition chimique du fourrage de prairie naturelle). — *Annuaire agricole de la Suisse*, XII. An., 4. f., pp. 260-272 fg. 2. Berne, 1911.

Switzerland

According to the experiments of Stutzer, phosphate manures have a limited influence on the growth of grasses in pots; they slightly increase the content of phosphoric acid, but not that of potash and nitrogen, although the latter is very high.

From the experiments carried out by M. Chavan in treating Alpine grass land with phosphate manure, the results would appear to be as follows:

1. The phosphate manure increases the proportion of cellulose in the plants in consequence of the accelerating action of phosphoric acid on the ripening of the grass.

(1) *Fühling's Landw. Zeitung.* 66, 13, 1911. (*Ed.*).

2. Phosphate and potash manure increases the proportion of phosphoric acid and potash in the ash.

3. Potash, but still more phosphoric acid, promote the absorption of the soil nitrogen by grasses and other non-leguminous plants; both render more active the utilisation of the organic matter of the soil.

4. Phosphate manure increases the potash contents of the plants.

These conclusions appear to differ very greatly from those of Stutzer, perhaps owing to the difference of the environment. At any rate M. Chavan thought it advisable to check them by experimenting on another alpine grass-land during the period 1905-1909. with dressings for three years of basic slag, potash salt, and basic slag + potash salt respectively, with control plots. These experiments generally go to confirm the first conclusions, and further lead to the following inferences:

1. Phosphate manuring applied at the rate of 80 kg. of phosphoric acid par ha. (72 lbs. per ac.) for three years, suffices for ten years.

2. Potash manuring at the rate of 120 kg. (107 lbs.) of potash for three years is insufficient.

3, In almost every case it is necessary to combine potash with phosphate, even for soils rich in potash.

With regard to the botanical composition of the grass, the phosphate manure is said considerably to increase the proportion of leguminous plants; on the other hand, potash manure alone has a limited effect, which however would become more prononced with a mixed treatment of potash salts and basic slag. Plants of the genera *Galium*, *Potentilla*, *Ranunculus*, etc., do not disappear under the action of the manure, but they likewise derive no advantage, which is a welcome feature in consideration of their injurious action on the health of cattle.

As to chemical composition, finally it should be noted that phosphate and potash manure raises the protein contents of grasses and plants of other families, but not that of the leguminous plants.

812 CHARLES, P. **The Use as Manure of Waste Products of Tartar Manufacture.** (Tartres et lies de vin. Les déchets d'usine des tartriers). — *Bulletin de l'Association des Chimistes de Sucrerie et Distillerie de France et des Colonies*, T. XXIX, No. 6, pp. 380-381. Paris, Décembre 1911.

France

The residues of exhausted lyes in tartar manufacturing works are found a nuisance owing to their bulk, but they have some value as manure because of the large quantities contained in them of carbo-hydrates convertible into good humus and especially nitrogenous substances, phosphates, potash, iron and manganese.

These residues, piled up for several months, undergo fermentation, especially an ammoniacal fermentation, which converts almost the whole of the organic nitrogen into ammoniacal salt. Before this can take place the substance must be kept moderately moist, which is done by putting it under open sheds and watering it according to the degree of heat developed. When this is done, the substance sets in lumps, and when broken up with the pickaxe looks like large clods of soil, which are crushed and sifted for sale.

The potash contained in the manure thus formed results from bitartrate of potash, the phosphates for the most part from animal black, and the oxides of iron and manganese from the colouring substance of the grape; the latter in spite of their small proportion, exert a notable accelerating action on the fermentation of the residues and their conversion into easily assimilated manure.

This manure is especially fitted for grape-growing soils, and mainly those poor in humus.

The extreme results of analyses, are as follows:

Water	7.15	- 33.00	%
Organic substances	28.00	- 77.83	»
Phosphoric acid	0.25	- 5,29	»
Potash	0.19	- 2,25	»
Sand, clay etc.	7.32	- 37.96	»
Total nitrogen	4.10	- 5 42	»

Although the organic substances are by no means to be disregarded, the organic nitrogen is the most valuable element.

818

Delorme, E. Manganese in Asparagus Fertilisers. — *L'Agriculture pratique du Centre.* 17e Année, No. 52, pp. 820-821. Blois, 24 Décembre 1911.

France

The author, during three years, was able to observe, on different soils, the advantages of manganese (bioxide of manganese) and of manganese lime in fertilising asparagus.

The experiments of 1911 took place on plantations in the valley of the Loire. The asparagus was planted on a good loam soil, 1.20 m. apart, along lines at a distance of 0.90 m., and at a depth of m. 0.20. The following were the manures tried and the results obtained:

First Trial.

8 years asparagus. Plots of 4 *ares* (1).

Manure per plot —	Yield per plot kg.
1. — No manure	152
2. - 30 kg. (1) of manganese lime	205
3. — 30 kg. of manganese	170
4. — 30 kg. of slag and 6 kg. of sulphate of potash	167
5. — 40 kg. of wood ash	167

Second Trial.

Mediocre soil. Old Asparagus. Plots of 3 *ares*

Manure per plot —	Yield per plot kg.
1. — No manure	90
2. — 20 kg. of slag and 6 kg. of sulphate of potash	110
3. — 2 kg. of slag and 10 kg. of manganese	112
4. — 2 kg. of slag and 10 kg. of manganese lime	118

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(1) 1 Are = 100 sq. metres = 0.098 rood.

(2) 1 kg. = 2.2046 lbs.

AGRICULTURAL BOTANY.

CHEMISTRY AND PHYSIOLOGY OF PLANTS.

814 HART, E. B. and TOTTINGHAM, W. E. **The Nature of the Acid-Soluble Phosphorus Compounds of some Important Feeding Materials.** — *Twenty-Seventh Anual Report of the Agricultural Experiment Station of the University of Wisconsin*, pp. 95-106 + tbl. I. Madison, Wisc., 1911.

The indications are that phytic acid, as an organic phosphorus complex salt of potassium, magnesium and calcium; that is as phytin, is widely distributed in nature, particularly in seeds as a reserve material.

United States: Wisconsin

The investigation described in the present paper deals with the phosphorus bearing bodies contained in some feeding materials. Representatives of different botanical families were chosen, and those parts of the plant that are used particularly for direct animal feeding were selected.

The chief conclusions are:

1. Phytin is present in the seeds of corn (maize), oats and barley, as well as in wheat kernel.

2. Phytin could not be isolated from rutabagas (swedes) or alfalfa (lucerne) hay.

3. Phytin appears to be distributed throughout the entire seed of corn (maize), oats and barley, whilst it is largely localized in the outer layers of wheat seed.

4. The proportion of phytin phosphorus is approximately 38 to 48 per cent. of the total phosphorus in these seeds.

5. The principal form of phosphorus in the rutabaga is inorganic, 64 per cent. of the total. There is in addition some unknown organic phosphorus complex, the phosphorus of which approximates to 24 per cent. of the total phosphorus of this root.

6. In alfalfa, which was cut when just coming into bloom and representing that stage of growth recognized as most suitable for forage, the inorganic phosphorus found was about 63 per cent. of the total.

There is too in alfalfa hay an unknown organic phosphorus complex, the phosphorus of which constitutes about 17 per cent. of the total phosphorus of the plant.

ANDREWS, ALBERT EDWARD. **The Active Constituents of the Indian Solanaceous Plants *Datura Stramonium, D. fastuosa* and *D. Metel*.** — *Journal of the Chemical Society*, No. DLXXXIX, pp. 1871-1877. London, November 1911. **815**

British India

The chief aim of the writer in carrying out this investigation has been to determine the amount and nature of the alkaloid constituents of *Datura Stramonium*, *D. fastuosa*, and *D. Metel* grown in India and compare them with those from the same species grown elsewhere.

The Indian species of *Datura* grow wild, *D. Stramonium* being met with in the temperate Himalaya from Baluchistan and Kashmere to Sikkim; *D. fastuosa* being found all over the tropical parts of India, and *D. Metel* growing chiefly on the North-West Himalaya and the mountains of Deccan.

The percentages of total alkaloid (calculated on water-free material) found in the Indian specimens of *Datura Stramonium* were: 0.186 in the seeds (hyoscyamine and scopolamine in the proportion of about 3 to 1 respectively); 0.41 to 0.45 in the leaves (hyoscyamine and scopolamine in the proportion of about 5 to 1), 0.25 to 0.26 in the stems; 0.214 in the roots. Hyoscyamine was the predominant alkaloid; on the other hand scopolamine was the only alkaloid found in the very small plants.

In the roots there was evidence of a third alkaloid. There was no indication of atropine. Indian *Datura Stramonium* bears favourable comparison with the European and Egyptian plants as regards the amount of total alkaloid that it contains. In the plants from the latter sources, hyoscyamine is stated to be the only, or the main alkaloid present, being in some cases associated with a small proportion of atropine.

The percentages of total alkaloid (in material as received) found by examination of a black variety of *Datura fastuosa* from Assam were as follows: Twigs and leaves, 0.119 (scopolamine and hyoscyamine, in the proportion of about 4 to 1 respectively; roots, 0.101 (scopolamine); fruits, 0.202 (scopolamine).

The seeds of this species grown in Europe, contain about the same amount of alkaloid as that found for the Indian plant, and contain scopolamine as the main alkaloid, associated with a small proportion of hyoscyamine and a little atropine.

The percentages of total alkaloids (calculated on water-free material) in *Datura Metel* samples from the Punjab were: — Leaves, 0,25 (scopolamine); seeds 0.25 (hyoscyamine and scopolamine);

capsules, 0.12 (scopolamine only). In the Indian plant the percentage of total alkaloid in the seeds and in the leaves is only about one-half what it is in the European plant.

816 SPAMPANI, C. **The Behaviour under Spectroscopic Examination of the Green Pigments of the Silver Fir (*Abies pectinata,* D. C.) growing in Different Aspects.** (Comportamento spettrofotometrico dei pigmenti verdi dell'Abeto bianco crescente nelle diverse esposizioni. — *L'Alpe, Rivista Forestale Italiana,* A. IX, No. 10-11, pp. 309-314. Bologna, Ottobre-Novembre 1911.

Italy

Spectroscopic examinations have been made of the alcoholic extracts of chlorophyll from the needles of four silver firs thirty years old, having respectively northern, eastern, southern and western exposures. These observations go to show that the absorption quotient s 1.892, 1.884, 1.804, and 1 778 respectively. According to Sig. Spampani this would indicate a greater respiratory capacity for the northern aspect, and a greater assimilating capacity for the western, which would be in agreement with practical observation, from which western exposure has always been regarded as best adapted to the growth of the silver fir.

These observations were carried out at the Royal Institute of Forestry at Vallombrosa.

SELECTION.

817 MARTINET, G. **Experiments in the Selection of Cereals. 2nd Series: Analytic Selection or Sorting-out Types.** (Expériences sur la sélection des Céréales, II^{e} série: Sélection analytique ou triage de types). — *Annuaire agricole de la Suisse,* 12^{e} Année, 4^{e} Fasc., pp. 223-258. Berne, 1911.

Switzerland

Swiss cereals are rarely very pure, homogeneous and thoroughly fixed strains; they are rather composed of a mixture of types which diverge greatly in point of time of maturity, general behaviour of the plant, botanical characters, nature of the grain and also yield.

According to the author, these divergences are in their essence due to variation, mutation, and hybridization; in a panicle of

Ormonts white oats, one brown grain was found; it turned out to be a perfectly stable variation which became the origin of a new and very good type of oats.

Each plant has its own special soil and climate, in which both the plant and the grain attain the greatest perfection.

Any change, however slight, in the conditions of the environment, always acts on the morphology of a variety; frost, for instance, will lead to a preponderance of the more resistant types; advancing or retarding the harvest will result in the predominance of early or late forms; drought or moisture will favour one type or another.

In Switzerland, with regard to oats in particular, while the old local strains are almost immutable, marked variety is found within a few years in the foreign varieties imported; grey grains have been observed in the variety Ligowo (yellow grain), these grains, due to spontaneous variation, must be regarded as best answering the special requirements of the country. The poor-sized grain and weak straw make this type unadvisable for growing. It is therefore necessary in the work of selection to distinguish between those forms adapted to nature and those suitable for man.

The different elementary types of a species to be improved should be subjected to a comparative growing test under absolutely similar conditions, to ascertain which is the most productive and best, then the latter should be taken as the point of departure and base of the future improved strain. M. Martinet describes this process of isolation of the forms by the name of " Analytic Selection ".

A point which has been much discussed is whether a single comparative test of the various forms is sufficient for discovering the best, or whether the test should be prolonged for several generations. Though in theory, Johannsen's conception as to constancy in elementary species is scientifically accurate, the isolation of these elementary species meets with serious difficulties in practice, and entails prolonged work in selection. A form which is dominant in the first year may become recessive in the second or third year. Further, in spite of every care in the tests, differences in natural or cultural conditions may encourage any one form at the expense of another, so that it is only on the basis of the total results of several successive generations, when a great quantity of material is available, that a real judgment can be pronounced as to the value of each particular type.

It is as well moreover to note that meteorological conditions vary from year to year, and according as the season is wet or dry, plants behave differently, and a type the yield of which is high with plentiful rainfall may completely fail during a period of drought.

Prolonged selection also has the effect of eliminating the cases of atavism and regression which result from previous hybridisations or variations which are not yet completely fixed.

To sum up, the system of analytic selection consists in the study by well designed and carefully checked growing tests, of the relative value of each of the types composing the local strain, in order, by successive elimination of the inferior types in each generation, to secure one, two, or at most three of the best, one of which, after growing trials on a large scale, will definitively be chosen as the stock for the new improved strain.

M. Martinet refers in detail to the results of his investigations with barley, wheat and particularly oats. We may reproduce here the data relating to the "F. Corboz" oats, one of the best varieties grown in Switzerland.

The experiments were carried out in two different localities, Mont-Calme and Aclens, and were begun in 1902. During the vegetative period very marked differences were observable between the different plants in point of general characters and maturing time. Some plants were still green when others were already ripe. All of them were distinguished by the light colour of the leaves and showed some resistance to rust.

The analysis of the Mont-Calme crop showed the following percentages according to the characters of the grain:

			Proportion
Type	I	White grain, short and thick, awnless	68 %
»	II	Yellow grain, long, slightly awned	8 »
»	III	White grain, long, awned	6 »
»	IV	Yellow grain, long, awnless	6 »
»	V	Dark grey grain, with long awn	3 »
»	VI	White grain, with dark spot, awned.	6 »
»	VII	White grain, with dark spot, awnless	3 »
			100 %

In the Aclens crop there was also found another type, type VIII, with yellow awnless grain, maturing late. Types II, III, V and VI were not represented.

In the crops of Mont-Calme and Aclens, in each type some of the best plants were selected and their seeds cultivated on a parallel basis in both places, adding to the Mont-Calme series Type VIII, and to the Aclens types II, III, V and VI. On the selection plots however the different types behaved in very distinct ways, and different characters were observable in the specimens of any one type, so that altogether some fifteen types were distinguished. The average yields of 1904 at Mont-Calme and Aclens were:

	Yield per square Yard.	
Type I	30.6 oz.	Lodged
» II	35.3 »	Not lodged
» III	40.6 »	»
» IV	34.4 »	»
» V	41.5 »	Lodged
» VI	42.9 »	»
» VII	37.3 »	»
» VIII	40.6 »	»

Types I, V, VI, VII and VIII were put aside on account of their tendency to lodging. Type IV, although inferior in production, was retained on account of its resistance to lodging, the weight of its grain, its earliness, and its power of resistance to frit fly.

In the course of a few years, this type has been adopted as the base of "an improved oats type", and by continuous selection its yield has been increased, so that it is now largely cultivated in the region.

LJUNG, E. W. **Selection of Rye at Svalöf in 1910.** (Redogörelse för förädlingsarbetet med rag under ar 1910). — *Sveriges Utsädesförenings Tidskrift.* Ar XXI, H. 6, 321-323. Malmö, 1911. **818**

The rye-selection work in 1910, in continuation of that of 1909, consisted of 319 plots including 21 comparative experiments, 122 controls, and 166 pedigrees. **Sweden**

The following results, which represent the extremes of the comparative experiments, are of direct practical value:

Variety	Yield per acre		Weight of		Date of harvest	Resistance to lodging (1)
	grain lb	straw cwts.	1 bushel lbs	1000 grains grammes		
Petkus (5 var.)	3 586.4—4 397.0	47.2—59.5	58.5—60.9	28.7—32.5	29—30/7	6—9
Brittany (2 var.)	3 623.0—3 876.5	50.5—48.0	60.2—60.6	26.7	27—29/7	4—7
Probstei (2 var.)	3 102 —4 010.5	51.3—61.0	59.3—60.2	28—30	26—28/7	5—8
Schlanstedt (2 var.)	3 868 —3 912.2	52.1—57.0	59.7—61.3	28.1—30.3	28—30/7	6—8
Göttingen	3 794.4	50.9	61.5	27.8	28/7	7—8
Sand	3 586.4	53.2	59.6	6	»	6
Norrland (2 var.)	3 548.9—3 564.1	52.5—55.8	61.4—62.2	27.8—28.8	»	7—9
Wasa (2 var.)	2 946.2—3 734.6	46.2—51.9	60.2—60.8	23.4—25	27—29/7	[illegible]—8
Östgöta grev	2 946.2	45.6	59.8	26.2	25/7	7—8
Prof. Heinrich (2 var.)	3 026.4—3 519.4	41.6—50.3	61.3	28.9—29.1	29/7	9—10
Gotland	2 589.1	36.0	57.6	21.6	25/7	6—7

819 DILLON CHARLES. **A Drought-Resistant Maize.** *The Country Gentleman*, Vol. LXXVI, No. 3070, p. 13. Philadelphia, December 2, 1911.

United States: Kansas. Mexico. China.

In China, near Shanghai, a variety of maize is grown by the natives that yields a crop in dry years when varieties introduced from America fail. This Chinese maize has been introduced into the United States by the Department of Agriculture. Its leaves, especially the upper ones, are so twisted that they seem to grow only on one side of the stalk, which is short, and stocky. The fan-like shield of leaves overtopping the plant is an arrangement for catching and holding the pollen and preventing its blowing away in the hot, dry winds.

The Mexican Hairy maize, just introduced by the United States Department of Agriculture, comes from the high plateau of Mexico. It is said to give a crop without a drop of rain during the growing season. It is a tall plant, with long, stretching joints, leaves set far apart and lopping at all angles. The ear is of the white Dent type. The root-system is a wide-spreading water-gatherer suited to desert places.

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(1) Scale — 1 to 10, in which 1 = all lodged and 10 all standing.

Last year Professor H. F. Roberts of the Kansas Agricultural College crossed plants of a dozen Western Kansas varieties of short season Dent maize with the Chinese, and vice versa. Some of the hybrids show the upright leaves of the Chinese; others have the covered tassel, some have the corkscrew chute for the pollen and others have all three; but all of them show the large ears of the American maize although definitely colored as a result of uniting the garnet or ruby grains with the pure white or pure yellow of the American strains.

Certain combinations were effected by crossing the Mexican with the Chinese, and vice versa, and by crossing the Mexican with the Western Kansas maize, all white varieties like the visitor.

Triple combinations also were made of the Mexican and the Chinese-American hybrids.

The result of this work will be determined next summer at the Experiment Station farm at Fort Hays, Kansas.

LEBEDIANZEV A. I. **Legitimate and Illegitimate Fertilisation in Connection with the Yields of Buckwheat in Russia.** (K Biologhii Grecikhi. Uvedenie. Neustoicivosti Uroxaiev Grecikhi. Pricini Neustoicivosti Uroxaiev Grecikhi. Leghitmoie i Illeghitmoie Opelenie). — *Selskoie Khosiaistvo i Liesovodstvo* (Agricultural and Forestry Review), God LXXI, pp. 380-413. S. Peterburg 1911. **820**

Russia

Owing to the high nutritive value of its grain, its adaptability to the most varied soils and the little care and attention its cultivation demands, buckwheat is a valuable factor in the zones of extensive cultivation in the Russian Empire. Nevertheless, the area under buckwheat has declined rapidly of late years. From 3 095 229 dessiatines (8 356 350 ac.) in 1887, it fell to 1 628 892 (4 397 550 ac.) in 1900. What are the causes of this reduction? Let us briefly examine the value of the crops. The average yield for Russia during the period 1883 to 1893 was, on black soils, about 22.4 poods per dess. (300 lb. per ac.), and on other soils 27.2 poods (363 lb.), while for the United States and Germany the yields were 46 and 65 poods (610 and 867 lb.) respectively.

The work here analysed endeavours to ascertain what are the causes which have led to the decline in the production of buckwheat in Russia. These causes may be divided into two groups:

1. External agents: farming and meteorological conditions, etc.
2. Biological causes: relating to the quality and characters of the plant itself.

External agents: methods of cultivation, temperature, etc. may to a certain extent increase the crop, but do not absolutely decide whether it shall be a success or a failure. It may be said that spring frosts sometimes cause great damage to buckwheat, but this does not in itself suffice to explain the failure of the seeds to form. There therefore remain to be examined the biological causes, particularly those influencing the growth of the seeds, which are the utilisable parts of the plant. The peculiarities of structure of the flower indicate the course to be followed in this class of investigation. Buckwheat is a heterostyle plant, as was first observed by Hildebrand in 1867; there are two sorts of plants: " long-style ", *i. e.* those with lengthened pistils and relatively short stamens, and " short-style ", the staminal filaments of which are rather long.

Putting aside for the moment self-fertilisation, which may be produced artificially, but which is morphologically out of the question, there are two different methods of pollination legitimate (the flowers being fertilised with the pollen of another plant of different type), and illegitimate (flowers fertilised with the pollen of another plant of the same type). According to the experiments of Darwin and others, such as Richer and Althausen, both methods of pollination are possible; but the legitimate results in a yield at least double that of the other (100 : 46). The experiments of Monteverde and Corseinsk on the contrary led to very different conclusions: with self-pollination 231 flowers yielded 6 seeds; with illegitimate cross-pollination 212 flowers yielded 7 seeds and with legitimate 207 flowers gave 112 seeds. The formation of seeds is therefore only guaranteed by legitimate pollination, the two others being completely ineffective. From the agricultural point of view the divergency of these conclusions cannot be entirely disregarded, as Darwin's conception in point of fact provides a greater probability of the formation of seed with an effective co-operation of two different fertilisations.

In order to arrive at a solution, with a great abundance of material and an extensive programme of experiments, the author set himself to clear up the following points:

1. The possibility of illegitimate pollination.
2. The conveyance of the pollen.
3. The numerical relation and distribution of the specimens belonging to the two different types.
4. Characters of self-fertilised plants, and their inheritance.

In a first series of experiments the plants were grown in pots, protected and covered with linen to prevent the approach of insects. The pots were divided into three sets:

I. 3 pots, each containing 10 "long-style" plants.
II. 3 pots, each containing 10 "short-style" plants.
III. 2 pots, each containing 5 plants of each type.

Artificial pollination was carried out so that the two first sets should be illegitimately fertilised, and the third legitimately.

From the figures of yield of straw and grain the following important conclusions may be drawn:

1. Illegitimate pollination may perfectly well produce the formation of seeds, but their number will be much lower than that obtained by legitimate pollination, 50 : 100.

2. Illegitimate pollination, which is not over-favourable to the formation of seeds, on the contrary greatly favours the formation of straw

3. Seeds obtained by illegitimate pollination are heavier than those obtained by legitimate pollination.

The author also carried out numerous other experiments, continuing and completing the above cited series of enquiries. The following are the most interesting general conclusions:

1. Self-pollination is not possible, or is only found in very exceptional cases

2. Illegitimate pollination gives positive results which vary sometimes within very great limits; in relation to the results obtained with legitimate fertilisation expressed by 100, they are: 50, 17, and 57.

These fluctuations depend on the individual characters of the plants and the origin of the seeds.

3. Legitimate pollination is the normal one, and it is three times more effective than that last mentioned.

4. Illegitimate pollination which naturally lowers the yield, appears to preponderate among specimens of the long-style type.

Therefore it is in the want of proportion in the number and distribution of the two different forms, with predominance of the long-style form, that the reason of the reduction in the yield of buckwheat in Russia must be sought. An intelligent work of selection, classification and cultivation might supply a remedy for this unfavourable condition of things.

821 HADMERSLEBEN, D. **Experiments in Selection with Forage Grasses.** (Züchtungsversuche mit Gräsern) *Illustrierte Landw. Zeitung*, 81. Jahrgang, Nr. 98, pp. 903-905; Nr. 99, pp. 912-913. Berlin, 9.and 13. Dezember 1911.

Germany

The Author has, during the last few years, been very intently engaged on the problem of the selection of forage plants.

In this article he sets out the results obtained by him in the cultivation of *Lolium italicum.*

Sowing took place at the beginning of April 1910; the plants grew rapidly so that by June it was possible to judge the extent of the tillering, the shape and characters of the leaves and stalks, etc. In this respect the different plots showed such want of uniformity that specialists themselves thought they were confronted not with one single species but with several species of *Lolium.*

The great difficulty consists in establishing a clear differentiating criterion between *Lolium perenne* and *Lolium italicum.* In point of fact, a number of plants exhibit indiscriminately the characters of either species, and have a marked hybrid character.

The Author was thus able to distinguish a very large number of plants, each of which constitutes a separate type, by its botanical characters and what may be called its agricultural characters.

Analytical selection, together with cross-fertilisation, may therefore result in isolating some of the most desirable forms and improving and spreading them.

The types studied by the Author may be subdivided into two groups: slow growing, Nos. 4, 14 and 25; and fast growing, Nos. 3, 15, 16 and 17.

Plants 3 and 15 are distinguished by their different method of tillering and their resistance; they possess in common a high yield of seed, great development of the stalk of the plant and poor development of the leaves.

It is chiefly the presence of these two types which makes *Lolium italicum* an excellent forage plant for seed growers, but not very much appreciated for its hay.

Type No. 6, on the contrary, fairly well answers requirements in both respects. In the very first year, indeed, two seed crops may be obtained, and the plant can reach a height of 50 to 54 inches. Its abundant leaves, 9 to 10 inches long, and from 0.35 to 0.4 inch wide, its stalks rich in juicy parenchymatous tissue, make this plant excellent for green forage. The yield is very high, 6 or 7 mowings being obtainable per year.

Type No. 17 produces excellent fresh forage but it must be passed over because it is too easily lodged, which always results in a poor seed crop.

The Author afterwards carried out a series of experiments to see whether these characters are inherited.

Even if the plants are kept completely isolated, the progeny are not all equal to the parent plant; some are distinguished by the appearance of new characters (recessive characters). This is explained by Mendel's second law of segregation, assuming that the parent plants themselves are hybrids.

This circumstance makes the work of selection very difficult, and it must be continued for generation after generation, until it results in types which are homozygous from the point of view of the specially desirable character to be fixed.

MACKINNON, EWEN. **Lucerne Seed, Colour, Germination and Anatomy.** *Agricultural Gazette of New South Wales.* Vol XXII Part 12, pp. 1058-1063. Sydney, December 1911 **822**

Commonwealth of Australia: New South Wales.

The seed of *Medicago sativa* may assume two different hues, brown and light. Is there any relation between the colour of the seeds and their vitality? In the present article the results obtained in experiments on this point are given.

The germination of 9 varieties was brought about by placing the yellow seeds and the brown seeds of each of them in one and the same dish in order to have in each case identical surrounding conditions.

	Montana	Arabian	Sand	Tamworth Broad leaf	New-Zealand	Provence	Turkestan	Mudge	Tamworth Flats
Yellow seeds	90	94	96	89	82	93	98	100	85
Brown seeds	19	6	6	33	69	17	74	94	78
Hard yellow seeds	8	12	6	12	24	10	2	0	10
Hard brown seeds	4	0	0	2	4	4	14	0	8

Average germination of the yellow seeds 92 %.
Average germination of the brown seeds 44 %.

Average germination of the hard yellow seeds 9.3 %.

Average germination of the hard brown seeds 4 %.

It is seen therefore that generally speaking and also for special varieties, the germination of the yellow hued seeds is much superior to that of the brown. Moreover, although every precaution was taken to prevent the appearance of fungoid diseases it was found, notwithstanding, that the brown seeds are more liable to be attacked; this was particularly conspicuous in the Sand and Turkestan varieties.

The colour may therefore be a good index in judging the age and vitality of the seeds. The brown colour arises from the state of maturity, but it may be due also to the unfavourable action of weather factors at the time of the harvest, or careless drying before storage.

CEREAL AND PULSE CROPS.

828 SCHLUMBERGER, O. **Influence of Hail in bending the Stalks of Gramineous Plants.** (Über die Ursachen abnormer Halmkrümmungen beim Sommerweizen). — *Illustrierte Landwirtschaftliche Zeitung*, 31. Jahrgang, Nr. 104, pp. 955-956. Berlin, 30. Dezember, 1911.

Germany

In wheat fields sometimes plants with the last, or last two, internodes bent strongly forward with the ear downward are found.

This position, which greatly predisposes the plant to lodging, is due in most instances, as appears from the considerations and observations of the Author, to a traumatic action of hail stones. At the time when the ears appear, a rapid growth of the upper internode of the stalk takes place, and is localised within a zone of growth immediately above the last node. At this point the tissues remain soft and flexible for a longer time, and it is only needful for some cause to act on the upper part of the haulm to make the latter leave the leaf sheath, which protec s that very zone of growth; the weight of the ear itself then causes the plant to bend forward.

In almost the whole of the cases the determining cause is hail. The phenomenon has been experimentally reproduced by cutting the leaf sheath at different heights

SCHAFFNIT, E. The Effect of Drought on the Composition of Rye Seed and Straw. (Zur Beschaffenheit des während der Vegetationsperiode 1910-1911 gewonnenen Saatgutes). — *Illustrierte Landwirtschaftliche Zeitung*, 31. Jahrgang. No. 99, pp. 911-912. Berlin, Dezember 1911. **824**

Germany

A short time after the last harvest, the Plant Pathology section of the Kaiser Wilhelm Agricultural Institute received from various parts of Germany specimens of rye grains distinguished by their abnormal hue, an orange yellow, while the usual colour of the ripe seed is brown.

An attentive analytical examination showed that in the most superficial part of these grains a noteworthy quantity of protein substances had accumulated which are not generally found in the same cells of fully ripe seeds. Owing to the length of drought during the summer; the vegetation period of the rye had been reduced and the normal course of the physiological process of ripening had been interrupted.

With regard to the properties of these unripe seeds it is remarked that their germinative power is generally very good (98 to 100 %), while on the other hand growing experiments prove that their germinating energy is much inferior (78 %) to that of the ripe seeds, which is 99 to 100 %.

Consequently, if these insufficiently ripened grains were used for sowing, it would be preferable to place them in loose, light soils where the shoot would have less difficulty in reaching the surface. The consequences of imperfect ripening are not limited to the fruit, they also make themselves felt in the other parts of the plant.

The normal colour of the haulm and leaves is generally a fine emerald green. This year however a number of specimens red or yellowish red in hue, and even violet, were also observed. This is due to an accumulation of carbohydrates and tannic substances caused by an unforeseen interruption of the metabolic process.

It appears evident now that not only is the straw of this hue good as forage, but it also possesses a higher nutritive value than that of the normal plant.

a) Violet straw = Protein: 5.8 % ; fatty substances: 1.6 %.

b) Ripe yellow straw = Protein: 3.1 %; fatty substances: 1.3 %.

825 HEKLITS, IVAN. **Wheat-Growing Experiments in Hungary.** (Buzatermelési kiserletek). — *Kiserletügyi Közlemémjek,* Vol. XIV, No. 5, November 1911. Budapest, December 30, 1911.

Hungary

A report by M. Ivan Heklits, as to experiments made in Hungary with four varieties of French wheat under the superintendance of the Royal Hungarian Station of Agricultural Experiments at Magyarovár. The following varieties were selected for experiment: "Bonfermier", "Bordeaux", "Gros Bleu" and "Poulard d'Australie", as they had already been experimented on in the country, the necessary amount of seed could be supplied by the proprietor of a large estate, and further the seed had already become partially acclimatised in Hungary.

The experiments were made in 1908-1909 and 1909-1910 on estates situated on the left bank of the Danube, except in the case of the "Poulard d'Australie" which had been tried in the experimental fields of four Schools and four Academies of Agriculture in different parts of the country.

For these experiments the Agricultural Station gave 200 lb. of seed of a single variety to each estate. But the Schools and Academies received 22 lb. of "Poulard d'Australie".

These varieties, which, in the country to which they are indigenous are of such excellent quality and so highly productive as to make them desirable for cultivation in Hungary, have unfortunately given but poor results there.

The climatic conditions of Hungary with its intensely cold, dry winters and rapid rise in temperature at the end of spring, are unsuited to the growing of such kinds of wheat, which are wanting in the requisite power of resistance to adverse influences.

In their native country the above-mentioned varieties are generally cultivated in mild regions near the sea-coast, and could therefore only thrive in Hungary after several years' culture.

The frost has been the chief cause of damage to these varieties of wheat, as well as the fact that the time necessary for their maturation is on an average 10 or 15 days longer than that required by the common Hungarian wheats. These foreign species are so ill able to withstand the frost, that part (about a third) of the experimental crops perished, even in a year (1909-1910) when the temperature of the winter months was higher than the average temperature of these regions in normal years.

Those plants which did not perish developed so satisfactorily, owing to the abundant spring rains, as to give hopes of a rich harvest surpassing that of the Hungarian species; but in consequence of their taking longer to ripen, they were greatly injured by the rise of temperature at the end of spring, so that the grain, unable to swell to its normal size, was scorched and withered, and of inferior quality to the Hungarian wheats, which gave excellent crops even under very unfavourable conditions.

However, the varieties subjected to experiment, showed great power of resistance to rust and stood up well, qualities wanting in Hungarian wheats.

It would consequently be of the greatest advantage to Hungarian farmers to be able to produce a variety of wheat combining the power of withstanding rust and of standing well with that of resistance to frost and rapidity of maturation; and experience unfortunately proves how extremely difficult it is to produce such qualities from the French varieties.

Notwithstanding this fact, it has been found possible to cultivate these varieties with advantage in certain parts of Hungary where conditions are such as to further their perfect development and enable them to bear as abundant a crop as in their native country.

It will therefore be necessary to cultivate them in the hilly regions of Hungary, where the changes of temperature are less accentuated than in the low-lying parts, and where, more than all, there is no risk of frost nor the harmful consequences of a slow maturation.

They must not be cultivated after crops which it is customary to harvest late in the season, as for example beets or maize; and experience proves that special care must be taken to grow them in carefully prepared soil.

This last condition is of paramount importance, in fact these varieties of wheat require the soil to be specially prepared and manured. This is not infrequently the weak point in Hungarian farming, and the cause of much of the failure of these foreign wheats to bear the abundant harvest they are accustomed to produce in their native country; as well as the fact that they are far more sensitive to adverse influences than the hardier native Hungarian varieties, with which they cannot vie in productiveness.

High Yields of Hungarian Wheat in Foreign Countries. (A magyar búza bö terméxi külföldön). — *Köztelek*, No. 2062. Budapest, 22 November, 1911. **328**

Hungary Hungarian wheat and flour are highly appreciated and much sought after throughout the markets of the world, owing to the fact that this flour furnishes a large quantity of dough of superior quality comparable to that given by the flour of improved English or German wheats.

This result must be attributed to the large contents of excellent quality gluten in this wheat.

These qualities of Hungarian wheat are counterbalanced however by the low productiveness in the country of origin as compared with the crops in western countries. According to the excellent work of Professor Schindler on wheat, published in Riga in 1893, the cause of this low yield lies in the continental climate of Hungary and above all in the rapid rise of the temperature at the end of spring, which reduces the time of vegetation, while the physiological processes preceding ripening take place in quite a different way in the case of wheats cultivated in western countries, where the climatic conditions are more favourable.

Consequently the formation of protein can proceed without any hindrance, but the time does not suffice to allow the starch to be transferred to the grain. Schindler and several authors after him therefore believed that the reason of the richness in protein and low yield of Hungarian wheat was generally to be found in the special conditions of the continental climate of the country. It is indisputable that the climate very injuriously affects the production, but the precise proportion in which the latter is reduced by this agent is not yet fixed. If western wheats in their countries of origin give a grain production of 3000 to 4000 kg. per ha. (45 to 60 bu. per ac.) and even more, while Hungarian wheat in the most favourable case does not, in its native country, furnish more than 1800 to 2000 kg. (27 to 30 bu.) to what extent can this difference be ascribed to the unfavourable influence of the climate?

The results of the experiments recently carried out in Prussia (Saxon province) with Hungarian wheats show that the varieties of Banat wheat and those of the region of the Tisza for several years yielded excellent crops, in spite of the climatic conditions, which were no better during the test years in Prussia than in Hungary itself.

The following data are extracted from the Report of the Director of the celebrated Experimental Station at Lauchstädt (7th Report, 1910).

The experiments were carried out from 1904 to 1909.

The rainfall during that period averaged 494.8 mm. (19.5 in.) per year; it did not therefore rise to the average in Lower Hungary. Several varieties of wheat were grown, especially those of Banat and the Tisza regions.

The average yields during the years 1904-1909 of these two varieties of Hungarian wheat and of some excellent varieties of « square-heads » and improved German wheats were as follows:

	Grain		Protein contents %
	kg. per ha.	cwt per ac.	
White Jasu ch Wheat	2 596	20.8	10.57
Square-head Strubes	3 578	28.6	11.14
» Rimpau. . . .	3 498	28.0	10.89
Banat Hungarian.	3 354	26.8	12.75
Tisza »	3 165	25.3	12.53
Square-head Cimbal	3 156	25.25	10.69
Rimpau Bastard.	3 139	25.1	10.20
Square-head III Beseler . . .	3 134	25.1	11.21

Therefore Hungarian wheat, from the point of view of production, ranks fourth and fifth among these excellent varieties of western wheat, and in point of protein it far excelled all the others.

The phenomenen recorded in the report of Prof Schneidewind, who conducted the experiments, that thin straw Hungarian wheats yielded abundant crops in spite of the unfavourable conditions of the experimental Station, is exceedingly important.

The explanation of this result is, according to the above report, that these varieties develop very rapidly, and are consequently better able to utilise the moisture of the winter and spring than the slower growing varieties.

The report also points out the fact that the Hungarian varieties proved so free from special requirements that the Station has decided to carry out experiments by mixing them with varieties of rye in a sandy soil.

In order to form an opinion as to the results in production, the fact that harvesting did not take place till the 22nd July must not be left out of consideration ; therefore vegetation continued some weeks longer than in Hungary, which certainly much affected the quantity of the crop.

Nevertheless, it would be possible considerably to increase the yield of Hungarian wheats in their home country, in spite of the unfavourable influence of the climate, by rational preparation and fertilisation of the soil.

827 RUTTER., W. P. **Wheat Growing in Canada, the United States and the Argentine.** — Review in *The Field*, Vol. CXVIII, No. 3075, p. 1206. Dec. 2, 1911.

Few books contain so much information concerning the wheat-growing resources of N. and S. America, as the writer has brought together and set forth in concise form in this volume.

Canada. United States. Argentina

He describes what has already been accomplished in developing the corn-producing capabilities of the United States, Canada, the Argentine, and some of the other S. American republics.

Not less interesting are the possibilities awaiting development.

To the intending emigrant, the latter part of the subject is especially attractive, though if he is well advised, he will also study the results of former enterprises, as a clue to what may be expected from land which is still unreclaimed.

Mr. Rutter must have studied his subject closely, for every authoritative source of information seems to have been drawn upon in the compilation of this book.

The particulars concerning the conditions, climatic and physical, favourable for the growth of wheat, show an intimate knowledge of the subject, and will be very valuable to new settlers in the Far West.

There is encouragement for the inexperienced in the assurance that few plants in cultivation are so indifferent to soil conditions as wheat.

It can be grown on any fertile soil, and is as much at home in the sands of N Africa, as in the *Black Lands* of Russia.

The tables in the book show the development of wheat-growing in the different countries of America.

The volume is a valuable guide to wheat-growing on the American Continent and its relationship to the food requirements of the United Kingdom.

828 CARLETON, M. A. **Winter Emmer.** — *U. S Dept. of Agr., Farmers' Bulletin, No. 466*, pp. 24+8 figs. Washington, November 4, 1911.

United States

Emmer (*Triticum dicoccum* [*T. amyleum*]) was probably derived from einkorn (*T. monococcum*), which apparently originated in south-eastern Europe. Emmer seems to have been found first in Switzerland and is grown in that country at present. It is also grown in Servia, Germany, Russia, Spain, parts of France and Italy, Abyssinia (up to 9000 ft.), northern India, Tibet, and parts of

China. All the best seed of spring emmer was introduced into the United States from Russia, and when grown in the northwestern plains it yields a grain entirely equal in quality to that of the original. The varieties grown in the Volga region are almost wholly of the white-chaff group. In north Caucasus a considerable quantity of red-chaff emmer is produced.

All varieties of emmer are considerably resistant to drought and certain varieties are very resistant to rust. They are also considerably resistant to the effects of wet weather in humid climates, though best adapted to rather dry regions with hot summers.

Black winter emmer was first introduced into the United States from France by the Department of Agriculture in 1904. It has been tested on many of the Departmental experiment farms with good results.

A five year test at Mc Pherson, Kans., gave an average acre yield of 45.5 bu., the highest yield obtained being 77 bu. in 1908. Five crops grown in the Panhandle of Texas averaged about 35 bu. per acre. Many cooperating farmers in the Western States report yields ranging from 25 to 60 bu. per acre. A seed-breeding farm in Wyoming has been selecting a strain of this black winter emmer with special reference to winter resistance. In 1909 this variety yielded at the rate of 42.5 bu. per acre and in 1910 a 10-acre field yielded at the rate of 69.1 bu. per acre. Both crops were grown under irrigation.

Emmer withstands extremes of climate much better than any other cereal and is well adapted for use as a general-purpose crop. Winter emmer is likely to prove of value as a feeding crop in a number of the Central, Southern, and Eastern States where oats are not profitably grown. It will ripen earlier and yield better than oats and may furnish fall and winter pasturage also. In the Rocky Mountain and Pacific Coast States, winter emmer will be particularly valuable as a stock feed under dry farming.

In the United States it has been most used for stock feeding. In a considerable number of feeding tests conducted at different stations, emmer has been found nearly, if not quite, equal to barley and oats for sheep and cattle.

The preparation of the land, the seeding, and subsequent management of the winter emmer crop are practically the same as required for rye and winter wheat. Emmer is really a subspecies of wheat and can be readily crossed with wheat by artificial means. It is being used in this way for the purpose of adding rust resistance to wheat hybrids.

329 **Native Rice-Growing in Java.** (La Culture indigène du Riz à Java. — Note rédigée par M. Amrhyn, chef de cultures au Congo belge, chargé, en 1911, d'une mission agricole aux Indes Néerlandaises). — *Bulletin agricole du Congo belge,* Vol. II, No. 4, pp. 744-748 (3 figs.). Bruxelles, Décembre 1911.

Dutch E. Indies: Java

Rice is cultivated in Java in three different ways:

1. — In flooded fields (sawahs).
2. — In wet fields.
3. — In dry fields.

Cultivation of Rice in flooded fields. — The rice fields form a succession of terraces arranged without any slope and surrounded by small banks to keep in the water. The latter is conveyed to the highest terraces and successively empties on to the lower fields.

Some time before starting work, at the beginning of the rainy season, the rice field is flooded. The soil slowly grows wet. When it is sufficiently softened, ploughing begins; each ploughing is followed by a harrowing, and cultivation continues till the surface is transformed into soft mud.

The nurseries consist of small areas surrounded by banks, which are likewise ploughed several times after flooding. The surface water is then drained off, and on the mud, side by side, whole rice ears are placed. After sowing, the nursery is once more flooded. In 8 or 10 days the water is drawn off during the night, and irrigation after that only effected by day. This goes on for about 2 months.

When the young plants are 18 to 24 in. high, they are ready for transplanting to the fields; they are dug up and made into small bunches; these are set out after cutting off the top of the stalk, care being taken to bury the root thoroughly. The distance between each bunch is 4 to 8 in.

After planting, the rice field is left dry for 3 to 4 days. It is then once more flooded. If the rice is yellow in appearance, the field is dried for some time, and, about 75 days before the crop, it is let dry for good. The attentions required consist in keeping the banks in good repair and weeding two or three times. It is advisable to clear away plants growing on the bank to get rid of vermin.

Rice-growing in wet fields. — This method is applied where there is not enough water for regular flooding. The field is flooded at the start of the rainy season. When the soil is soaked the water is run off. The soil is then ploughed deeply two or three times and harrowed down. The rice seed is sown in the plough furrows and immediately covered by harrowing. The soil is kept cool by surface cultivation. If the weather is dry and water is at hand, the field is flooded from time to time. During the heavy rains the rice grows very rapidly. By means of well designed banks the water is then kept as long as possible on the field; it is however necessary to provide for a slight current in the water, because in stagnant water, rice is largely attacked by a caterpillar which gets inside the stalk and makes the plant wilt.

Cultivation of Rice in dry fields. -- This method is only practised in mountain regions The soil is tilled with the plough or spade, or sometimes not at all. For sowing, all that is done is to dig holes with a hoe or spade 6 to 8 in. apart, and put down a few grains.

Oryza montana and *O. sativa* are the two species generally grown. The former is used for dry rice fields and the latter for flooded or wet rice fields. The most frequent diseases of rice are caused by *Leptocorisa acuta*, an insect which attacks the young ears and thus prevents the formation of the grain; *Tylenchus Oryzae*, a nematode which attaches itself to the roots; the caterpillars of *Nymphula stagnalis*, *Hesperio philiona*, etc., are likewise very frequent; to prevent their metamorphosis, it is recommended to leave the field flooded.

For harvesting the rice, the ears are cut one by one and then tied up in bundles. These bundles are stacked and conveyed to the store houses. After the crop, the land is very often allowed to lie fallow for six months, or earth-nuts, sweet potatoes and other quick growing vegetables are cultivated.

Under native cultivation the average yield per acre is 900 to 1080 lb. of paddy. With improved methods, yields of 2700 to 3600 lb. per acre are obtained, producing about 80 % of dry rice.

Rice-growing in Japan. (Agriculture in Japan). -- *The Tropical Agriculturist*, Vol. XXXVII, No. 5, p. 476. Colombo, November 1911.

In Japan the bulk of the rice crop is grown on fields under irrigation, and, as a rule, besides the rice, a dry crop is taken on the same land each year.

The annual output of rice is valued at about £81 000 000, and the protection and encouragement of its production, form the chief problem of agricultural administration, the Government employing every possible means for improving the cultivation. Rice is distinguished as nonglutinous and glutinous, but the output of the latter does not exceed 1-10th of the former. Glutinous rice is boiled and eaten, while the nonglutinous variety is converted into flour for making cake, and also employed in the manufacture of the spirituous liquor called « sake ».

In improving the quality of rice, as well as the method of preparing and packing the grain, so as to give it the best value in the market, a system of rice inspection has been established with a view to producing a uniform quality.

There are also institutions known as " common rice depôts " for the storage of rice. The prepared grain may be consigned by a cultivator to these warehouses, where a rigorous inspection is made with a view to grading the grain so that all of one quality may be bulked together.

Receipts are issued to the consignors, and these may be sold or otherwise disposed of by the holders. This arrangement has been instrumental not only in improving the quality of rice, but also in greatly facilitating transactions.

Rice is packed for sale in bags made of straw.

Upland rice (Hill paddy in Ceylon) is cultivated in high lands and is coming to take the place of the millets usually grown in such situations. The proportion of upland rice does not, however, exceed 3 per cent. of the total rice output, though there is a tendency for this proportion to increase.

Japanese rice finds its way chiefly to Hawaii, to the United States and to Canada, as well as to Russia in Asia, China and even England.

There is some importation of rice, but Indian grain is looked upon as inferior in quality and is chiefly consumed by the poorer classes.

ROOT CROPS.

881 ZOLLA, D. **A New Basis for the Appreciation of the Value of Potatoes**. (Une nouvelle base pour l'appréciation de la valeur des pommes de terre). — *Revue générale des Sciences pures et appliquées*, 22e Année, No. 22, p. 887. Paris, 30 Novembre, 1911.

France This article sets out briefly the principles to be observed in estimating scientifically and methodically the industrial value of potatoes. The varieties obtained up to now (there are about 600) are so numerous that it is necessary to classify or catalogue them without taking as the exclusive basis the colour and form of the tubers, the value of these characters being rather uncertain.

Microscopical examination affords great aid from this point of view; it has been found that in « Table Potatoes » and « Starch Potatoes » the tubers are different in histological structure. In the former we find very small cells, while in the latter the tissues are less compact, with large cells very rich in starch.

This new character of cell density is of great practical value to the manufacturer and in selection. To obtain table potatoes fine grained tubers will be chosen for sowing, whilst for industrial purposes a different course will be adopted.

The varieties most used in the starch industry are three in number: *Magnum bonum*, *Richter's Imperator* and *Géante bleue*. The last named, even when other conditions are equal, always gives a lower yield than the other two, which is explained by the fact that the cells of the *Géante bleue* tubers are very small, so much so that in the cut slices the number of cells with walls intact, which consequently less readily yield up their starch, is proportionately higher than in the *Magnum bonum* and *Richter's Imperator*.

These few examples suffice to show the practical importance of this character of « cell density » in the estimation of the industrial and commercial value of the tuber. The histological structure of the tuber in fact clearly reflects the qualities and aptitudes of the plant.

FORAGE CROPS. MEADOWS, AND PASTURES.

HUNTER, JAS. **The "Clifton Park System" of Pasture making.** — *The North British Agriculturist*, Vol. LXIII, Nos. 50-51, pp. 796-797, and 813-814. Edinburgh, December 14 and 21, 1911. **832**

The system consists in the use of certain deep-rooted plants for making sheep pastures, and in a suitable succession of crops. The following mixture of seeds is recommended: **Great Britain**

	b.
Cocksfoot (*Dactylis glomerata*)	10
Tall Fescue (*Festuca elatior*)	5
Tall Oat Grass (*Arrhenatherum elatius*) , ...	5
Rough-stalked Meadow Grass (*Poa trivialis*) . . . . . ,	1
Red Clover (*Trifolium pratense*) . . . . , . . , . . .	2
Dutch Clover (*T. repens*)	2
Alsike Clover (*T hybridum*)	1
Yarrow (*Achillea Millefolium*).	1
Burnet (*Poterium Sanguisorba*)	8
Kidney Vetch (*Anthyllis Vulneraria*)	3
Chicory (*Cichorium Intybus*)	3
Total per acre . . . lb.	41

The rotation consists of the following

1st year	Turnips
2nd year	Oats, thinly sown, with the above seeds-mixture under them
3rd to 6th year	Pasture
7th year	Turnips
8th year	Oats

The mixed deep-rooted plants enable the surface soil to be gradually deepened and the humus content of the soil is increased by the powerful growth of the roots of the forage plants remaining four years on the field

In the experiments carried out since 1890 on the Clifton Park Farm, Northumberland, with this system, on very poor soil in a region subject to frequent drought, this method has been found effective even without manuring

[illegible] GROLL, E. **Experiments on Moor Pastures.** (Versuche auf Moorweiden). *Deutsche Landwirtschaftliche Tierzucht*, 15. Jahrgang, No 49, pp 589-590. Hannover, 8. Dezember 1911.

Germany: Bavaria

The Bavarian Moor Reclamation Station has formed grazing lands which yield very good results on the high-moors of Bernau and Gross-Karolinenfeld.

In the summer of 1909, 13 head of Pinzgau cattle were kept on 3.5 ha (8 ac. 26 poles) of moor pasture. When turned out to graze they weighed 3432 kg (67 cwt. 2 qr. 4 lb.) and when brought away 136 days later their total weight was 4574 kg. (90 cwt.). The gain in weight was therefore 1142 kg. (22 cwt. 1 qr. 25 lb.) or 326 kg. per hectare (2 cwt. 2 qr. 12 lb. per ac.). This means, at a price of 1 franc per kg. (4 ⅓*d* per lb.) a return of 1142 fr. (£45.4*s* 6*d*), or 326 fr. per hectare (£5.4*s* per acre). The working costs plus interest and redemption of the capital invested amounted to 432 fr. (£17.2*s*), leaving a total net profit of 710 fr. (£28.2*s* 6*d*), or 203 fr. per hectare (£3.5*s* per acre).

In the year 1911 the experimental grazing land of Bernau was of an area of 4.7 hectares (12 ac. 35 poles). This time 10 Pinzgau, 8 Simmental and 5 Algau animals were turned out. The Pinzgau animals were allowed 2 ha. of grazing land and the Algau and Simmental 2.7 ha. The results of the experiment will be seen from the following table:

Breed	No of animals	Years old	Grazing time Days	Total weight when turned out lb	Total weight when brought in [illegible]	Gain in weight lb
Pinzgau . . .	10	1-2	134	5 020	6 347	1 326
Algau.	5	2-3	120	4 007	4 375	368
Simmenthal .	8	2-3	120	6 911	7 412	500

The gain in weight by the Pinzgau animals exceeds that of the other breeds, but the short duration of the experiment does not allow as yet of drawing any further conclusions from this.

It will always be advisable, whatever the breed in question, to graze nothing but young animals on moor pastures, because the weight of older animals makes them sink in deeper and do great injury to the turf, especially in rainy weather.

The favourable results of the experiment are to be attributed in part to the skilful treatment of the pastures. In the case of moor pastures even when completely reclaimed, technical supervision should always be at hand, so as to ensure proper care and maintenance, failing which even pastures which in themselves are good may undergo great depreciation in a short time.

FIBRE CROPS.

884 **Cotton-growing in Anatolia.** (La Culture du Coton en Anatolie). (Communication du Vice-Consulat de France à Smyrne). — *Bulletin de l'Office du Gouvernement Générale de l Algérie*, No. 24, pp. 378-379. Paris, 15 Déc. 1911.

Turkish Empire: Anatolia

From the point of view of cotton-growing the vilayet of Aidin is divided into three important zones, which differ from each other both in geological character and climate. All three zones are formed by alluvia of the rivers traversing them: these are the Meander, the Caistro and the Ermus. The first is particularly favoured from the point of view of nitrogenous organic substance which it obtains from the enormous quantities of liquorice plants (*Glycyrrhiza glabra*) which it possesses; these plants being Leguminosae fix the nitrogen of the air and transfer it to the soil, and thus give an excellent green manure. The second zone possesses the same characters, but its soil is more clayey, and in summer it quickly loses its moisture. The third zone is the most extensive, but it also has the most porous soil, which requires abundant irrigation to grow cotton.

The following are the varieties of cotton grown:

The "American" already mixed and without distinct type; the red "Yerli", a good producer, the yellow "Yerli" poorer in production but with long fibre and resembling silk, the green "Yerli", unmarketable and which must be given up, the "Egyptian", which does not stand the environment, and finally the "Livadia", which is the best from every point of view.

The average annual production for each zone is as follows:

	Oke	
Ermus	3 871 000	96 775 cwt
Meander	29 199 200	729 980 »
Caistro.	2 779 600	69 490 »
	35 849 800	896 245 cwt

The crop is gathered by hand. The unit of production differs very much according to the varieties and districts. Generally, the average production is 256 kg. per "deunum" (the "deunum" being about 40 rods, this gives just 1 ton to the acre).

The proportion of the fruit is distributed as follows, according to the varieties:

	Calyx	Seed	Cotton
Yerli	25 %	50 %	25 %
American	—	65 %	35 %
Livadia	—	50 %	40 %.

Various causes give rise to poor crops and inferior products. Among these causes may be cited the want of rest of the soil, late work, want of harrowing, non-selection of seeds and especially shortage of hands.

This condition of things will last as long as the economic existence of the grower is not assured, and until every step has been taken to promote selection of the seed and multiply nurseries.

There has been formed, at Smyrna, the Eastern Industrial Company, to carry on cotton growing, and Anatolian cotton has already attracted the attention of the Cotton Growing Association of Liverpool.

Cotton in China. (Report of the Austro-Hungarian Consul in Shanghai). (Chinesische Baumwolle). — *Oesterreichische Monatsschrift für den Orient,* No. 12, S. 185-186 Wien; Dezember 1911. 385

China

Twenty-two cotton firms of Shanghai have combined to form the "Cotton Anti-Adulteration Association of Shanghai" with the object of preventing fraud in the Chinese cotton industry. The Association will also provide the expenses necessitated by the Cotton Analysis Station in China.

Cottons showing more than 15 % of water under analysis will not be exported. Those with 12 to 15 % of water will have a label attached to them "Below Standard".

Chinese cotton-growing and trading will derive great advantages from these preventive measures against adulteration.

The cotton industry in China numbers 814 180 spindles engaged in spinning, of which 433 656 are at Shanghai.

China in 1910 exported 1 247 304 pikuls (1 494 885 cwt.), of a value of about £3 788 000. The exports for last year have increased by 100 %, and by 60 % in reference to the average for the last

4 years. The following table gives the exportation of Chinese cotton in cwt. from 1906 to 1910:

1906	916 121
1907	1 176 256
1908	730 368
1909	754 389
1910	1 484 885

The exportation of cotton from China is becoming more and more considerable, and within a short time it will compete keenly with Indian cotton.

Land previously under opium will soon all be utilised for cotton.

With a view to improving the production, North-American seeds were imported; but they lose their original characters by the third year, in adaptation to the Chinese conditions.

Altogether there are splendid prospects in front of cotton production in the Chinese Empire.

SUGAR CROPS.

386 BENDANDI, N. **Experiments on thirteen varieties of Sugar Beet.** (Esperienza di confronto su tredici varietà di bietola zuccherifera). *L'Avvenire agricolo*. Anno XIX, No. 11, pp. 431-434. Parma, Novembre 1911.

Italy

The Author was desirous of contributing to the solution of the following problem: Are beets with a large production of root weight but a low sugar content more advantageous than those with limited weight and high sugar content? With this object, he submitted 13 of the best varieties of sugar beets to a test. The experiments were conducted in the province of Parma, in sandy soil worked to a depth of 12 inches by a good summer ploughing, and plentifully manured with farmyard manure and 4.8 cwt of mineral superphosphate, 0.8 cwt of sulphate of ammonia, 2.4 cwt of plaster and 0.8 cwt of sulphate of potash per acre.

The results of the experiments are summed up in the following table:

	Production of root cwt per acre	Percentage of sugar	Sugar per acre cwts	Degree of purity of Sugar	Value of Yield Per cwt	Per acre			Beets bolted %
					pence	£	s	d.	
Reinmann	343.56	12.32	42.32	83.72	[illegible]	15	6	8	11.2
Rabbethge N. . .	326.09	13 30	43.36	83.92	11.18	15	3	11	0.8
Vilmorin extra rich	343.40	12.62	43.33	83.33	12 57	17	19	7	1.0
Deutsch B. B. . .	393.08	11.57	45.47	88.17	10.37	16	19	7	2.0
Vilmorin rich . . .	345.00	12.22	42.12	83.92	10.66	15	6	2	3.6
Deutsch B. G. V. .	404.15	13 10	52.93	83 87	11.09	18	13	4	2.4
Ziemann	370.80	12.35	47.79	78 20	11 28	17	8	6	1.2
Deutsch	352.29	12 37	43.61	83.78	11.38	16	13	11	2.8
Deutsch D. S. . .	347.96	12.42	43.21	82.60	11.62	16	16	9	2 8
Schlieckmann . .	343 12	11 37	11.07	80 97	10.56	15	1	11	3.2
Zapotila . . .	396 80	13.82	50 03	86.13	11 42	18	7	9	1.2
Indigenous	325.14	12 17	39 56	82.50	10.66	14	8	8	8 0
Rabbetghe Z. . .	337.93	13.52	45 69	84.60	11.28	15	7	7	1 5

It should be noted that the sugar content was generally low for the year 1911.

Cercospora, which is the cause of much damage in some years to sugar beet crops, also appeared in 1911 in the experimental field in a proportion nearly equal in the different varieties. The variety showing the most resistance was the Schlieckmann; the Deutsch D. S., the Rabbetghe N. and the Indigenous were likewise little subject to attack, comparatively speaking.

The Author concludes that the Zapotila variety was the one which gave the best results in 1911.

SAILLARD, EMILE. **Beet Growing in Russia. The Combined Drill.** (Culture de la Betterave en Russie. Le semoir combiné). — *Journal d'Agriculture Pratique*, 75° Année, No. 52, pp. 810-811. Paris, 28 Décembr 1911. **887**

Russia

The climate of the region traversed by the Dnieper is peculiar to it. There is a scanty rainfall (400 mm. = 16 in.) and the winter cold is excessive (25 to 27° C.). The method of cultivation adopted is also quite unusual, the treatment of the soil is generally in the following rotation: fallow, winter corn, beet, spring corn; the scarcity of moisture making a necessity of the frequent return to fallow. On nearly all the beet farms the combined drill is used, by which it is possible along the same line, to manure the soil and afterwards sow the seed at a lesser depth.

For spring manuring it is usual to use per hectare 130 to 150 kg. (116 to 134 lb. pe[illegible]c.) of superphosphate and 15 to 30 kg. (13 ½ to 27 lb.) of nitrate.

By means of the combined drill, the poverty of the soil in water may be overcome. In fact the manure and seed having been sown together and in the same line, the young plant, after germinating, at once finds nutritive solutions at its disposal of which it reaps the benefit at the first signs of vegetation.

But an excess of manure is to be avoided as producing too highly concentrated solutions which would be harmful to the young plant and might arrest its development.

In autumn basic slag is sown at the rate of 300 kg. per ha. (270 lb. per ac.).

Very little nitrate and no potassic manure is given because the land is rich in nitrate and potassium.

When beets follow corn, to which 35 000 kg. per ha. (14 tons per ac.) of dung are given, they utilise a fair proportion of the fertilising matter contributed by the latter.

RUBBER, GUM AND RESIN PLANTS.

888 **The Wild Rubber trees of Brazil.** DUBOSC ANDRÉ. Le Caoutchouc. — *Revue générale de chimie pure et appliquée.* III^{e} Année, Tome 14, N. 24, pp. 421-429. — LAMY TORRILHON. Exposition internationale du Caoutchouc à Londres. — *Journal d'Agriculture tropicale,* II^{e} Année, N. 125, pp. 323-329. — J. HUBERT, Rés. par LAMY-TORRILHON. Les arbres à Caoutchouch et les reserves de Caoutchouc de cueillette de la région amazonienne. — *Journal d'Agriculture tropicale,* II^{e} Année, N. 126, pp. 361-363. Paris, Décembre 1911.

Brazil The great extension of the applications of rubber has led to the examination of the problems of its production. The apprehension that one day the natural supply of the Brazilian forests might fail and the hope of competing in the sale of this valuable product have resulted in natural resources being sought for everywhere in the forests of Asia and Africa, and have caused the question to be studied from the point of view of cultivation, turning to account the climate and soil of the tropical countries under the dominion of the great European Nations. The same reasons however, at the same time urged industry and science towards a solution of that very problem by entirely divergent paths, *viz.* the regeneration of the rubber of used articles, the creation of rubber substitutes, and finally one of the most attractive and difficult problems, the chemical synthesis of rubber. And indeed the possibility of increasing the production and limiting the causes of waste and loss of the raw material seems to set at rest all fears as to a shortage of the commodity, although consumption is still increasing. The natural reserves are for that matter sufficient in number and in wealth to meet the most enormous demands, pending other resources being added thereto in order to regulate and lower the price of the product.

The world's consumption of rubber is calculated by M. A. Dubosc as being, for 1911, 85 000 tons, with a coefficient of increase of 8 % per annum, which would raise the total world's consumption to 180 000 tons about 1920, and the business turnover calculated by Sir H. Blake at 1100 million per year, would attain to more than 2 1/2 thousand million francs.

Of the whole of this enormous consumption, the greatest part is supplied by Brazil with its wild rubber, Para, which also ranks highest in point of quality. In 1910 Brazil is said to have produced 38 000 tons of Para, that is, one-half of the world's consumption.

Each great producing region appears to have its special rubber plant. In Brazil the area of Amazonas, which is the principal producing centre amounts to nearly 6 1/2 million sq. kilometers (2 509 000 sq. miles) *i. e.* 12 times the area of France. In all parts of this State there are found one or another of the varieties of *Hevea* or *Castilloa*, but especially that wonderful tree, *Hevea brasiliensis*, which with well-conducted tappings can when mature, at about 35 years, yield up to 12 kgs (26.4 lb.) of rubber. The number of trees standing in the two States of Para and Amazonas is estimated at 200 million. In the State of Amazonas, the field of working of the natural « seringaes » (rubber estates) is growing day by day, in consequence of exploration being carried to the very remotest ramifications of the great rivers. which are the confluents of the Amazon; unfortunately the impossibility, almost, of transport makes the cost price unremunerative. Still, the reserves of rubber ripe for tapping in the Amazonian region are not limited to the great number of *Hevea brasiliensis* forming the principal wealth of that country. They are also formed by other natural rubber bearing species of appreciable value, at least equal to that of some famous plants of other countries.

While in the southern part of the basin of the Amazon, *Hevea brasiliensis* occupies the leading place, *Hevea benthamiana* supplies the best quality rubber north of the Amazon, especially in the basin of the Rio Negro.

On the Rio Negro there are however a certain number of other species of *Hevea*, the economic value of which is not well known as yet, such as *Hevea lutea*, *apiculata*, *rigidifolia*, *minor*, etc.

Hevea guyanensis and some allied species supply what is called in Brazil the « Borracha fraca » or poor rubber.

The genus *Micranda* has not been studied much as yet from the point of view of the value of its product, but according to Ule, a species disseminated in the Upper Basin of the Amazon, *M. siphonoides* yields a good product. Of the genus *Sapium*, represented in the region by at least a dozen trees, only *S. Taburi* is known as supplying a good quality rubber. This tree is fairly frequent in the alluvial soils of the Amazon and its southern confluents. It might be worked with much greater success if some instrument were used for tapping which would get at the laticiferous vessels without touching the wood.

Castilloa Ulei, commonly called the « caucho », is distributed almost throughout the whole Amazonian region, but the largest reserves of this rubber-bearing species exist in the southern part of the State of Para.

Lastly *Manihot Glaziovii* and *Hancornia speciosa* must be mentioned. *Manihot* extends along the coast from the south of Para to the province of Parahyba, while *Hancornia* only becomes important beyond that Province, whence it descends along the coast down to São Paulo, while at the same time it makes its way inward as far as the south of the province of Matto Grosso. It will be seen that the extent of rubber production in Brazil is not restricted by the number or variety of producing trees, although the principal sources will remain *Hevea brasiliensis*, *Castilloa* and *Manihot*, especially the first. We have seen that more than 200 million plants are contained in the Brazilian stands of *Hevea*. The yield of a *Hevea* is estimated at 5 kgs (11 lb.) per season, which would make one thousand million kgs, or a million tons of rubber per season. Present exportation, it will be remembered, is only 38 000 tons and the consumption of the world 85 000 tons. The conclusion which logically follows and which all competent men have adopted is that Brazilian production will successfully hold the field against all other production if a serious effort is made towards judicious exploitation of this immense wealth. M. Hubert concluded his lecture at the International Rubber Exhibition in London by stating that the reserves of rubber bearing trees in the Amazonian region appear inexhaustible. It is, he said, only a question of greater facility of communication to enable them to be worked and more suitable methods to be adopted for collecting the rubber in order to spare the trees. But it must further be added that the hygienic conditions of the country and the industry of rubber gathering and coagulation itself must be carefully studied, because the question of rubber will in the future be one of great importance, and among the different producing countries, Brazil is by far the most advantageously situated from this point of view. M. Lecomte (1) describes the economic condition of this production in Brazil. A frightful death rate is decimating the population of rubber gatherers in the upper parts of the river and is due chiefly to bad food and excesses of every description, which weaken the men, making them fall easy victims to the malignant fever and the beri-beri which are endemic in these wet woody regions, where the sun can never purify the soil covered with decomposing organic substances.

In order to realise clearly, independently of the very powerful philanthropic arguments, the economic difference produced by this state of things, it is sufficient to compare the working costs of different producing regions. M. Lecomte calculates them for Brazil at 2515 francs per hectare (£ 40.4s 9*d* per acre), while Stanley Arden reckons 816 francs per hectare (£ 13.1s 1*d* per acre) in Malaya, Bray 886 francs per hectare (£ 14.2s 6*d*) in the Dutch East Indies, Rousselet 885 (£ 14.2*s* 2*d*) for the Congo and finally M Fauchère indicates the amount of 471 francs (£ 7.10*s* 8*d*) for Madagascar.

As to the Brazilians, says M. Lamy-Torrilhon, they are perfectly well aware of what they have to do if they wish to retain the predominant position in the rubber market. At the present time they have quality and quantity of the product in their favour; but they must devote the whole of their activity to restoring the destroyed forests as near as possible to the shipping ports, they must multiply roads, must facilitate the importation of labour and, above all, not abandon their method of curing, which, owing to the qualities it imparts to their rubber, forms the brand of their products.

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(1) *Le Caoutchonc et la Gutta.* Paris, September, 1911.

Three laws were passed on the 17th May 1911 for the protection and extension of the rubber industry in the State of Para; the second of these laws authorises the Brazilian Government to contract a loan abroad intended for protecting rubber production (1).

889 **Report of an Experiment in Tapping *Hevea Brasiliensis* made at Eala (District of the Equator, Belgian Congo).** *Bull. agricole du Congo Belge.* Vol. II, No. 4, pp. 668-677 (2 dgrms.). Bruxelles, Décembre 1905.

elgian Congo

This was an experiment on 5 *Hevea brasiliensis*, 6 ½ years old, which bore fruit for the first time in 1910.

The tapping, carried out on the Malay method with a half-herringbone cut, covered one fourth of the girth and included 5 lateral incisions; paring was only carried out to the extent of removing a strip of bark 15 cm. (6 inches) in width. The initial cut was pared daily. The five trees experimented on supplied altogether, from the 6th March to the 28th July, 2574 grammes (90.77 oz) of dry rubber, being a yield of 515 gr. (18.15 oz) for each (358 gr., 12.53 oz, of best quality rubber obtained by coagulation and 157 gr., 5.62 oz. of scraps). This average would, for a plantation where the individuals are spaced at 6 metres (19 ½ ft.), correspond to a yield of 143 kg. per hectare (127 lb. per acre), being 105 kg. (93.45 lb) of best quality rubber and 38 kg. (33.55 lb) of scraps.

The average production of latex per tree per day amounted to 10 gr. (0.35 oz). The average grade of the latex collected, for the entire duration of the experiment, was 31.4 %. The quantity of scraps produced daily averages 1.4 gr. (0.49 oz) of dry rubber, corresponding to 4.4 gr. of latex (1.55 oz).

Three periods of maximum yield were found, followed by distinct declines in production.

The first of these periods (from the 4th to the 13th paring) corresponds to the beginning of the reaction of the plant to the wound; the second (from the 50th to the 61st paring, from the 9th to the 25th May), corresponds to the period of transition from the season of the great rains to that of medium rains; the third (from the 78th to the 98th paring, from the 16th June to the 12th July) takes place in the heart of the dry season.

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(1) See *B*, July 1911, No. 2182; Feb. 1912, No. 273. (*Ed.*).

From the point of view of variations in the percentage of rubber in the latex, two periods may be distinguished: one (from the 1st to the 48th paring) where the grade of the latex is constantly below the average; the other (from the 48th to the 109th paring) where it is always above. This observation confirms the fact that the latex is richer in rubber during the period of rest than during the wet season. The percentage of rubber in the latex was: 25 % from the 6th March to the 8th May; 35 % from the 8th May to the 15th July. In the Equatorial regions, in consequence of the short duration of the dry periods, the seasons have a much smaller influence than elsewhere on the yields.

VARIOUS CROPS

Seeds and Plants Imported into the United States during the Period from October 1 to December 31, 1910. — *U. S. Dept. of Agr. Bur. of Plant Ind., Bull. No. 227*, pp. 60. Washington, November 2, 1911. **840**

The present inventory (No. 25) includes the material collected during the period from June to September, 1910, by Mr. Frank N. Meyer, who was exploring the region which lies along the Zerafshan Valley and in the vicinity of Samarkand, Tashkend, Old Bokhara, the oasis of Merv; Chartchni, Andijan, Guldscha, Tereck-Dawan, Osh, Kostakos, Kizil-Kurgan, and Khokan in Russian Turkestan, and the cities of Kashgar, Kan-Shugan, Ulukshat and Irkestan in Chinese Turkestan. Mr. Meyer secured during his stay in this region 141 different specimens, some of which are of special importance. **Turkestan**

Among them is a hardy dwarf Prunus (*Prunus lycioides* (Spach) Schneider) from the mountain slopes near Wishist at an altitude of 3000 to 7000 feet (1000 to 2100 metres), which Mr. Meyer suggests may be of value in the breeding of bushy forms of the almond or as a stock for the almond in dry regions. *Prunus prostrata* and *P. microcarpa* may possibly be utilised in the creation of an economic cherry bush, while the various forms of *Prunus cera-*

sifera divaricata called « Alitcha », in Turkestan, may be of distinct value to the plum breeders because of their early-fruiting character, their remarkable productiveness, and their resistance to drought and heat.

The apricot growers of Turkestan grow varieties which have sweet instead of bitter kernels, which they use for confectionery purposes. Mr. Meyer has imported 11 varieties of these and recommends that the whole subject of the utilization of apricot kernels be studied.

An extensive and successful work in the binding of drifting desert sands was carried on at Chartchni, Turkestan, by the Russian Government. The railroad, which was previously in continual danger of being covered by shifting sand dunes, has been completely protected by the use of certain drought and alkali resistant plants (*Salsola arbuscula* Pallas; *Calligonum caput-Medusae* Schrenk; *C. aphyllum* (Pall.) Guerke; *Haloxylon ammodendron* (C. A. Meyer) Bunge; *Carex physodes* Bieb.) seeds of which Mr. Meyer secured for similar experiments in the United States.

A large fruited form of the oleaster (*Eleagnus angustifolia*) a small tree remarkable for its extreme hardiness and resistance to drought ; wild roses (with red or yellow or white flowers); an unusual collection of watermelons (*Citrullus vulgaris*) and muskmelons (*Cucumis Melo*); the Afghanistan pistachio (*Pistacia vera*) ; black and red currants are amongst the other noteworthy introductions.

Of material sent in by correspondents, it is worth while to emphasize a new relative of the guava, *Psidium araça* from Minas Geraes, which is said to be sweeter in taste than the guava; a new variety of alfalfa, which originated in Norway and which is reported to be hardier and larger than the ordinary types grown in the United States ; three distinct varieties of the Chinese jujube (*Ziziphus jujuba* Miller); a remarkable tree *Gonocitrus angulatus* (Willd.) Kurz, related to the citrus fruits which lives on the seashore in mangrove swamps in India ; a quantity of the wild wheat of Palestine for use in breeding drought-resistant varieties; a leguminous plant, *Cassia mimosoides*, from Assam, recommended as a cover crop in banana plantations to keep down the weeds; the « Kameeldoorn » (*Acacia giraffae* Willd.) of South Africa, an extremely hard-wooded, drought-resistant tree ; *Passiflora ligularis*, from Mexico, and a variety from Java (variety *Perbawati*), relatives to the southern maypop (*Passiflora incarnata*), for breeding experiments with this fruit ; one of the largest of the large-leaved trees of the Chinese forests from Hupeh, central China (*Tetracentron sinense* Oliv.); a new hybrid from the giant wild rose from Burma, *Rosa gigantea*; the

Paraguayan «Yerba maté» (*Ilex Paraguariensis* St. Hil.); four varieties of Japanese sugar canes for trial as a forage plant in the South; four species of tropical persimmons, *Dyospiros affinis* Thwaites, *D. attenuata* Thwaites, *D. insignis* Thwaites, *D. moonii* Thwaites; from the island of Ceylon the yebel-nut plant (*Cordeauxia edulis* Hemsl.), a newly discovered leguminous shrub which occurs in the poor sandy soils of the dry regions of Italian Somaliland and produces sweet and nutritious nuts; a spineless lime and a seedless lime from Trinidad; the Aomori chestnut (*Castanea crenata* S. et Z.) from Hokushu, Japan; the Sampson tangelo, a hybrid between the pomelo and the tangerine which has been originated by the Office of Crop Physiology and Breeding Investigations; and the Etonia or flowering citrange, a hybrid between the common orange and the hardy Japanese trifoliate orange, also a product of the same office.

MONTEMARTINI, L. **Early Nutrition and Subsequent Development of Tobacco.** (La nutrizione iniziale e lo sviluppo successivo del tabacco). — *Le Stazioni sperimentali agrarie italiane*, Vol. XLIV, fasc. 10, pp. 794-796. Modena, 1911. **841**

Italy

In April 1911 the Author sowed a quantity of *Nicotiana Tabacum* var. *arvensis* in five earthen pans filled with sand. To this sand, in the first pan, he added a little Wagner's salts; in the second nitrate of potash and nitrate of ammonia (without phosphorus); in the third, potassium phosphate (without nitrogen); in the fourth, phosphate of lime (without nitrogen or potassium); finally in the last, nitrate of ammonia (without phosphate or potassium). Until the time of transplantation the plants were watered with distilled or rain water. The young plants growing in the fifth pan lived but a short time; those in the first were the best developed of all at the time of transplantation; they were followed by those of the second and third pan, while those in the fourth appeared rather sickly.

Transplantation was carried out in the second half of May, to two beds, one well manured and exposed to the sun, and the other rather sterile and in the shade. The young plants were all put at the same distance and tended in the same way.

In August, the difference in favour of the plants of the fourth pan (fed at the outset with phosphate of lime) was evident in the two beds. In the shade, they surpassed the others in height and diameter of leaf; in the sun, they had reached the maximum growth of leaf and put out stout buds, while the production of capsules and seeds had remained normal.

This proves the efficacy which may be possessed — as was already shown by the same Author in regard to other Solanaceous plants — by initial feeding on a basis of phosphate of lime from the point of view of the growth of these plants.

942 RINALDI, G. **Biometrical Study of some Principal Varieties of the Genus *Nicotiana* and Ratio of Weight Vetween the Different Organs of the Plant.** — (Studio biometrico su alcune principali varietà del genere *Nicotiana* e rapporto in peso fra i diversi organi della pianta). — *Bollettino tecnico della coltivazione dei tabacchi*, R Istituto sperimentale in Scafati, Salerno Anno X, No. 6, pp 331-336. Scafati, Novembre-Dicembre 1911.

Italy

The author has studied some of the principal varieties of tobacco, comparing them with each other during the whole vegetative period, determining the quantity of moisture needed for germination, also that contained in the plants, in the different organs and at the different periods of growth ; the effects of topping and the conditions of growth

Some of the most remarkable results are given herehere·

It was confirmed that the heaviest seeds are those of *Nicotiana rustica* Chinensis and *N. rustica* Erbasanta, and that those weighing less are in successive order the seeds of the varieties Herzegovina, Havana, Brazil, Kentucky and Sumatra.

In the Kentucky, Brazil and Havana varieties, the weight of the topped plants was superior to that of those not topped ; in the Erbasanta and the Chinensis, the weight of the plants with ripe seed was greater than that of the topped plants; the Herzegovina and Sumatra retained their weight almost unaltered, with a slight excess in favour of the untopped plants

Among all the varieties, the earliest were those of the group *N. rustica* which were also pretty regular in growth; the Brazil, Herzegovina and Havana grew fairly well, while the Kentucky, late at the outset, afterwards attained to great growth. The Sumatra, during the entire course of its vegetation, was slowest in development. Topping produced effects which were chiefly evident on the Brazil, Havana, Erbasanta and Chinensis; but less perceptible on the Kentucky, and still less again on the Herzegovina and Sumatra.

The author is led to the following conclusions:

The two varieties of the section *rustica* studied by him, *viz.* the Erbasanta and the Chinensis, show a great resemblance both in their exceedingly early vegetation and their contents of dry substance and water, and they differ greatly from the five varieties of the section *Tabacum* enumerated above. Their seed produces plants which at the beginning show a higher content of dry substance than that of the others, and in which, from the time of formation of the first pair of leaf whorls, this grade declines, but once more increases until maturity, finally however remaining below that of Havana and Sumatra.

Of the five other varieties, the Havana and Sumatra are those varying least from each other. Both are slow of growth, but very regular; their contents of dry substance are almost always greater than that found in all the others, and the number of capsules, as well as the yield of seed, is very low.

Kentucky and Brazil show great resemblance with each other, manifested chiefly by their irregular growth, the thickness of their leaves, the grade of moisture and dry substance of their different organs and the weight of the plants.

The Herzegovina shows irregular behaviour diverging from that of the other varieties.

SOUL. **The Cultivation of Coffee in Kikouyou (British East Africa).** — *La Geographie.* No. 5, pp. 281-286. Paris, 15 Nov. 1911. **848**

The country inhabited by the tribe of the Kikouyous, in British East Africa, is a volcanic plateau extending from North to South, from Nairobi to Mount Kenia.

British East Africa

The coffee plant introduced into the country is *Coffea Arabica*, originating from the southern provinces of Abyssinia. The coffee plantations are localised in the environs of the town of Nairobi and the station of Kyambu. In these two districts the coffee plant thrives and has already yielded good results. From the point of view of temperature and rainfall it has found favourable conditions in Kikouyou.

The economic importance of coffee-growing on the high plateaus of equatorial Africa, just below the Equator, cannot be overlooked. At a time when Brazil is making every endeavour to monopolise the coffee production of the world, and consequently to fix the prices, it is not uninteresting to know that a country of European colonisation presents climatic and soil conditions fairly similar to those which the Arabian coffee plant requires for its growth, and that this country has facility of communications with the coast by the Uganda railway. For England especially there is the temptation to substitute for the island of Ceylon (where a parasite, the *Hemileia vastatrix*, has destroyed the coffee plantations, which have had to be replaced by the tea plant) as a producing country, another colony equally well situated for the exportation of this valuable product.

FRUIT-GROWING.

244 LIPTAI, ALBERT. **The Vine-growing Crisis in the Region of Tokaj-Hegyalja, in Hungary**. (A Tokaj-Hegyalja Válsága). — *Magyar Gazdák Szemléje*, XVI Year, pp. 213-224. Budapest, December 1911.

Hungary

The Tokaj-Hegyalja region in Hungary which has for many years produced one of the most famous wines in the whole world, has beeen heavily scourged by the phylloxera, which has devastated every vineyard in the neighbourhood.

But the damage done by this insect is perhaps not the greatest misfortune that could happen to the vine-dressers, for thanks to their exertions and the support of the government, the reconstitution of the destroyed vineyards is almost an accomplished fact. The most serious damage comes from the fact that while the disease was spreading, consumers of Tokaj wine both at home and abroad gradually got out of the habit of drinking it. And furthermore, foreign consumers who found they had been deceived into purchasing bad imitations of it manufactured in large quantities both in Galicia and Germany, became suspicious of these so-called Tokaj wines and accustomed themselves to drink lighter and cheaper wines nfinitely inferior to the bona-fide Tokaj.

Now that the work of reconstitution of the vineyards throughout the 31 communes of this region has been satisfactorily accomplished and the wines produced are equal both in quality and quantity to what they were before the phylloxera came, the Government is being constantly urged by the press to regulate the trade in Tokaj wines in order to prevent the sale of imitations.

The originators of these suggestions admit, without a single exception, that by the severe measures contained in act XLVII of the year 1908, against fraud in the manufacture of wines, the Government has made it exceedingly difficult to sell foreign wines in the country under the name of Tokaj. It is to be hoped, therefore, that special precautions may enable the Government to succeed in restoring confidence in Tokaj wines and that foreign buyers may once more return to the habit of purchasing them.

In order to make its action more effectual, the Government has not waited for the regulations concerning the trade in wines to become definitely fixed; for the Ministry of Agriculture alone has already bought 250 000 litres of this wine to be re-sold by its agents. Besides this it has built a wine-cellar at Satoraljanjhely capable of holding 10 000 hectolitres, which will be under its administration and may be enlarged if need be.

MACDONALD, L. **The Olive in Australia.** *The Journal of the Department of Agriculture of Victoria*, Vol. IX, Part 12, pp. 832-839. Melbourne, December 1911. **845**

Commonwealth of Australia

Up to the present the olive has not received an attention commensurate with its importance as a warm temperate fruit, and with the exception of South Australia, all the other States of the Commonwealth have neglected it. This disfavour is due to two causes:

1. The rural population consisting of men of the North is not accustomed to eat this fruit.

2. The returns of this culture are not immediate, and the methods of growing and of treating the product are little known.

It has nevertheless been noted that the climate and soil are exceedingly well adapted, and that the olive thrives where other fruit trees perish; in addition to this, the oil obtained is equal in quality to that produced elsewhere.

In the whole of Australia, South Australia alone publishes figures in relation to this culture; here follow those indicating the production of oil during the 10 years period 1900-1910:

Production of Olive Oil in South Australia.

Years	Gallons	Years	Gallons
1900-1	6 529	1905-6	17 762
1901-2	11 327	1906-7	16 164
1902-3	12 422	1907-8	16 954
1903-4	11 864	1908-9	12 998
1904-5	15 980	1909-10	16 464

During the season 1909-1910, which is one of the best, there were, however, imported 15 734 gallons.

The following table gives the figures for the total imports of the Commonwealth from 1906 to 1910.

State	1906 gals.	1907 gals.	1908 gals.	1909 gals.	1910 gals.	Total (5 years) gals.
Victoria	13 038	15 300	16 425	12 883	17 297	74 943
New South Wales . .	14 531	19 058	17 247	21 273	25 986	98 095
South Australia . . .	4 111	8 256	9 442	12 013	15 753	49 575
Queensland	876	861	931	901	997	4 566
Western Australia .	3 357	2 162	4 111	1 884	3 512	15 026
Tasmania.	247	244	181	251	105	1 028
Total for the Commonwealth	36 160	45 881	48 337	59 205	63 650	243 233

There is therefore a constant rise of imports, notwithstanding the import duty of 2 shillings per gallon.

No particulars are available of the importation of preserved olives, the figures being merged with those of other preserve imports.

The Olive Tree in Australia. In 1844, 50 olive trees of 5 varieties were brought from Marseilles to South Australia. Since then this culture has gradually developed. The following table gives the enumeration of the olive trees of South Australia.

Years	Number of trees	Years	Number of trees
1900-1	61 740	1904-5	83 138
1901-2	66 852	1905-6	85 433
1902-3	78 642	1906-7	83 153
1903-4	80 560		

In the State of Victoria, olive growing is less advanced although the olive thrives, and the oil is good. The figures for the State are these :

Years	Number of trees
1902	3 748
1905	4 502
1908	3 817

Botanical Note. – The numerous varieties of olives to-day cultivated are descendants or varieties of the original species *Olea europea.* The two most widespread species in Australia are *O. paniculata* (R. Br.) and *O. apetala* (Vahl). There are also species of *Notelaea,* such as *N. ligustrina*, *N. ovata* and *N. longifolia.*

Climate. — The olive tree grown is robust and easily acclimatised. It is not only suited for the Mediterranean regions, but adapts itself exceedingly well to the climate of Australia, where it is found everywhere, though in small quantities. It likewise is not true to say that 90 miles from the sea it will no longer grow, as in Australia it fruits several hundreds of miles away. Furthermore it thrives just as well, if irrigated, in semiarid regions, as on the coasts where there is plenty of rain ; above all, however, it needs a temperature never falling below —2° C. (20° F.). A temperature of —12° C. (10° F.) kills the trees (this took place in France in 1820), and that of —7° C. to —10° C. (14-18° F.) injures them. With some varieties a temperature of —4 ½° C. (24° F.) is injurious to the fruits.

Soil. — The fact that the olive grows on hill sides in soils where other trees do not thrive should not cause it to be lost sight of that there are few cultures which respond so well to proper treatment. It will grow very well in deep alluvial soils, rich in lime and potash, but less well in a soil having large contents of nitrogen.

Irrigation. — With irrigation it is possible to plant olive trees in lands which do not receive more than 500 to 625 mm. (20 to 25 inches) of rainfall ; this is the case in the Goulburn Valley. Good results are also hoped for in the north of the State of Victoria where the rainfall is only 250 to 500 mm. (10 to 20 in.). For the rest, the old European countries which have practised irrigation for a great number of years, as well as Arizona and California, have proved that the olive when well watered thrives, whatever the dryness of the climate.

TRUELLE, A. **The Marketing of Apples in North America and England.** (La présentation des pommes de table sur les marchés du Nord de l'Amérique et sur le marché anglais) — *Revue Horticole.* No. 1, pp. 10-11. Paris, 1 Janvier 1912. **846**

France. United States. Canada. England.

In France, to facilitate the exportation of farm produce, the Railway Companies and extra-parliamentary or technical Commissions appointed by the Ministers of Public Works and Agriculture, have published reports and circulars bringing under the notice of growers the methods, measures and information required to enable them to put this produce on foreign markets under the most favourable selling conditions. Hitherto, particular attention had been devoted to questions relating to packing and transport, and the classification of the products had been neglected.

The classification as regards the United States and Canada is almost identical. The leading considerations are: uniformity, freedom from defects and suitability of the fruits for the market requirements and public taste. Uniformity of size is more valued than fruits grown to excessive proportions. The fruits are divided into: selected, best quality, second quality and culls. The latter are used for cattle feeding and industrial purposes.

The diameter of selected apples should not be less than 62 mm. (2.42 inches), and 56 mm. (2.18 in.) for the two following categories of varieties, respectively · 1) " Ben Davis ", " Willow Twig " " Baldwin " and " Greening "; 2) " Romanite ", " Russet " Winesap ", " Jonathan " and " Missouri Pippin ".

The selected and best quality fruits must be hand picked.

In England, the combined Fruit Dealers' Associations have this year decided to give preference in purchases to growers who divide the fruits into three classes. The diameter of the eating apples should not be less than 62 mm. (2.42 inches), and that of the cooking apples not less than 75 mm (2.92 in.).

847 CLERGET. **Californian Fruit Production and Export.** — *La Géographie*, No. 5, pp. 316-317. Paris, 15 Nov. 1911.

United States: California

South California bears a great resemblance in point of climate to the Mediterranean Coasts. The conditions therefore are favourable to fruit trees. Thanks to the improvements in packing and transport, California has been able to turn to account the natural advantages of its climate. It sends out fresh and dried fruits. The consignments of fresh fruits amounted to 14 072 car loads in 1910. Grapes predominate (4 948 cars), and then follow peaches (2 518), pears (2 361), plums (1 552), apricots (290), and cherries (250).

The production of dried fruits was 148 275 tons in 1910. This latter figure is made up as follows: raisins 62 500, prunes 37 000, peaches 25 000, apricots 15 250, figs 3 775, apples 3 000, sundry 1750.

California also produces almonds (3 200 tons) and walnuts (8 500 tons). The apples are partly used for manufacturing cider and vinegar. More than a thousand car-loads were exported to England and Germany.

One of the cultivations undergoing greatest development is that of the orange and lemon trees: 40 599 car-loads of the citrus fruits were forwarded in 1910. The trees were imported from Bahia, (Brazil).

The following are the statistics of fruit trees:

	Number of trees
Orange	9 370 198
Peach	8 587 794
Plum	8 147 638
Apricot	2 308 600
Apple	1 736 748
Lemon	1 522 875
Pear	1 301 000
Olive	1 048 161
Almond	1 011 748

California is bound to benefit greatly by the reduction of freight and transport charges owing to the Panama Canal.

The Californians are past-masters in the art of packing and cold storage methods.

The Carrier Companies also play a very important part in the exportation of fruits, owing to the cheapness of their tariffs, the rapidity of transit, the equipment of their stock and their care in the operations of loading and unloading.

BUNYARD, E. A. **An Index to Illustrations of Pears**. — *Journal of the Royal Horticultural Society*, Vol. XXXVII, Part 2, pp. 321-349. London, December, 1911. **848**

Great Britain This bibliographical index is a sequel to that already given for illustrations of apples (1).

The "Safo". *(Pachylobus edulis).* (Le Safo). — *Bull. Agricole du Congo Belge*, Vol. II, No. 4, pp. 597-599 (1 fig.). Bruxelles, Décembre, 1911. **849**

Belgian Congo The « Safo » (*Pachylobus edulis* G. Don, var *Mufabo* (Ficalho), Engl.; synonyms: *Canarium mufabo* Ficalho; *Pachylobus edulis* G. Don., Hemsl.; *Canarium Saphu* Engl.; *Pachylobus Saphu* Engl.; *Canarium Safu* Engl., De Wild), of the family of the Burseraceae, is a Central African fruit tree about which almost complete ignorance prevails. In the Belgian Congo the Safo is found in almost every variety. The fruit looks like a large violet plum; it is the pulp surrounding the comparatively bulky seed which is eaten. The «Safos» are trees 8 to 12 metres in height, with many big fluted branches; the leaves consist of 13 to 15 leaflets, the inflorescences are in the shape of big composite bunches.

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(1) See *B.* Nov.-Dec. 1911, No. 3158. (*Ed.*).

The Safo is hardly cultivated at all by the natives. It may be useful to cultivate it on the chief stations of the Belgian Congo. In view of the difficulty of getting the plant to take root when eplanting, it is advisable to sow the seeds in nurseries at a distance of 25 cm. (10 inches) apart, or even in baskets or pots made locally. As soon as the plants reach 30 to 35 cm. (12 to 14 in.) they are put down in the ground at a distance of 5 to 7 metres (16 to 23 feet) from each other. It is recommended to prop up the standards and prune the stalk so as to lead to the formation of the crown 2 metres (6 ft) above the ground.

FORESTRY.

850 VESOZKII, G. **Influence of Forests on the Distribution of Rainfall.** (O ghidroklimatisceskom Snacenii Liesov dlia Rossi). — *Liesnoi Jurnal* (Forest Review), XLI. G, Vep. 1-2, pp. 119-158. S. Peterburg, 1911.

Russia

The author discusses the problem of the influence of forests on the distribution of rains from a new point of view, most ingenious in conception. Above the forest masses great quantities of watery vapour condense under specific conditions, and are then carried afar, in the form of clouds and rain, by the winds; hence the action at a distance exercised by forests on the succession and amount of rainfall in regions sometimes very remote.

After a lengthy and detailed discussion, supported by abundant data, the author is led to the following important conclusions:

1. There is no doubt that forests exert a direct influence on the circulation of watery vapour between oceans and continents.

2. This influence, very slight on the coasts and near the sea, becomes the more manifest as we penetrate deeper into the interior of continents, in proportion as the amount of vapour coming direct

from the ocean diminishes and the mass of vapour produced by local evaporation increases.

3. In the interior of continents, in the direction chiefly of the prevailing winds, the wooded areas of any particular spot are not of direct importance from this point of view, but only the woods in surrounding regions through which the air currents conveying moisture to that spot take their way.

4. In this sense the most effective action is exercised by forests along the route of moist winds, and in non-mountainous regions (" Gateways "). The air currents, during their passage over mountains, always yield up a rather high proportion of their moisture.

5. For Russia, the southern part of which is the chief sufferer from drought, these " gateways " are supplied: 1) by the Swedish-German depression; 2) by the North-West plains, from the Gulf of Finland to Podolia; 3) and lastly by the extensive open zones of Russia and Northern Siberia. The forests of these regions unquestionably exercise an influence on the distribution of rain in Southern Russia.

6. The forest absorbs and evaporates an enormous quantity of rain-water and the other plants growing on the soil do the same. In zones devoid of vegetation, even if covered with water, evaporation is much less intense. This is why, very frequently, deforestation is followed by the formation of marshes in the plains.

7. Deforestation can be carried out on well drained, highly permeable soil, on condition however of taking care always to appropriate the soil thus cleared for intensive cultivations, and leaving suitably located strips of forest to regulate the distribution of snow.

8. The greater the moisture of the soils on which a forest stands, the larger of course the quantity of water evaporated by that forest. Consequently, from the hydroclimatic point of view, the conservation of forests is more desirable than ever on soils which collect in their subsoil a large quantity of easily absorbed water.

9. What has been said in paragraphs 3, 4 and 5, enables us to conclude that it is necessary, from the climatic point of view, to have regard to forest conservation not in places which suffer from want of rain, but in regions where moisture abounds and which lie on the route of the aerial currents conveying clouds and rain to the former places. Consequently a greater extension of the wooded areas of North-Eastern Russia through which the Atlantic winds pass, would be immediately attended by an increase of the rainfall in the most southern parts of the Empire.

851 MELDER, CHR. **Influence of the Root System on the Grouping of Cultures around Pine Trees in Arid and Sandy Soils.** (Vlianiie Komevoi sistemi na Raspredielenie Podrosta okolo Sosnorik Scimiennikov Sukhoma Boru). — *Isviestiia Imperatorskago Liesnago Instituta* (Transactions of the Imperial Forest Institute). Vepusk XXI, pp. 215-245. S. Peterburg, 1911.

Russia

The root system of pines growing in arid, sandy soils comprises two descriptions of roots: the horizontal ones intended to supply the plant with the mineral substances it needs, and vertical roots, the principal function of which is the absorption and conveyance of water from the subsoil during dry periods. Owing to the drainage effected by the superficial roots, a circle of more or less width forms around each trunk where the growth of other plants is made much more difficult. When the horizontal roots perform their function properly and group themselves systematically around the plant, this circle and the crown develop with equal symmetry. The greater the growth of the root system and the finer the crown, the wider the circles, and concomitantly, the less is the growth and density of the underwood.

If all the roots on one side wither, the branches on the same side likewise wither, if the roots do not develop equally the treetop is irregular, and the circles are incomplete; finally, when the root system is very weak, the circles shrink almost to the point of disappearance, while the underwood envelopes the trunk closer and closer. Absence of branches and poor growth of the roots are generally found on the North-Western side, which proves that they are due to the direction of the prevailing winds.

With regard to the vertical roots, it would follow from certain observations, that their withering leads to the direct death of the top of the tree.

852 MELDER, K. **Forest Types in Courland.** (Tipologuitocheskii otcherk liesov Kourlandskoi gouberni). — *Isviestiia Imperatorskago Liesnago Instituta*, V. XXI, pp. 57-98 + fig. 1 + c. 1. S. Peterburg, 1911.

Russia

The forests of Courland present great interest from the point of view both of dendrology and the international timber market.

The Government of Courland is one of the most easterly provinces of Russia. Thanks to its geographical situation and the vicinity of the Baltic Sea, it enjoys a temperate, moist, marine climate; the winters are mild and drought never prevails. The soil, of quaternary origin, comprises a flat interior region, a flat coast region, a dunes region and a moraine region.

On this territory the following forest types are distinguished:

1. The Scotch pine with heather — Pure stands of Scotch pine particularly on the dry sandy soil of the dunes; a surface cover of *Cladonia, Calluna vulgaris,* and *Vaccinium vitis idaea;* height 19 to 25 m. (60 to 80 feet).

2. Scotch pine with Norway spruce undergrowth on the cool sandy soil; surface cover of mosses and Vacciniaceae, chiefly *Vaccinium Myrtillus*; height 22 to 30 m. (70 to 97 ft.). The type splits up into three classes, characterised by the Norway spruce undergrowth and the absence of the aspen. A very widespread type.

3. Scotch pine on alluvial sandy soil. — Similar to the last named, but without spruce undergrowth. Not very frequent.

4. Scotch pine on sphagnum moor. - Is found distributed among the last named types; it is especially frequent in the coast zone; it consists of low, stunted trees of Scotch pine; sometimes intermingled with birch, likewise poor in growth.

5. Norway spruce on moist soil. — These stands are usually found on sandy loams in the moraine region; mixed with aspen, birch and Scotch pine; surface cover of moss, *Convallaria, Oxalis,* Vacciniaceae, etc.; height 22 to 30 m. (70 to 97 ft.) The type is divided into 3 classes characterised by the aspen. On the coast, after clear felling, it does not spring up again naturally; all that grow there then are grasses, aspens and birches. The type is found very widely.

6. Norway spruce mixed with oak. — On fertile soil, generally clayey loam and clay; characterised by greater height. On clear fellings a luxuriant growth, especially of aspen, is observed.

7. Mixed broad-leaved trees. - - Formed by the spontaneous local species, with the birch predominating, after which come common alder, aspen, spruce, ash and oak; in the marshy depressions on the coast and the interior region characterised by the sandy loam soil: height 15 to 22 metres (49 to 70 ft.).

8. Common alder. — Closely akin to the foregoing, into which it is probably transformed; the alder predominates, very frequently mingled with birch and spruce. Not very frequent.

9. Surviving stands of oaks, which were formerly widely disseminated, particularly on fertile clays and sandy loams in the interior region; have almost disappeared to-day.

In conclusion, while the oak was formerly widely spread in the interior, the Norway spruce predominates in the moraine region, interrupted here and there by the Scotch pine, which, along the coast line, forms a belt about 1 kilometre (0.62 mile) extending to Riga.

853 **The Finest Fir Stand in France** (La Forêt de la Joux). — *Revue des Eaux et Forêts*, Tome LI, 1re-2^{me} L, pp. 3 and 56 + fig. 1. Paris: 1 and 15 Janvier 1912.

France

The Forest of Joux in the French Jura, incorporated in the State domains in 1674, is described as the finest fir stand in France. This forest stands on Jurassic limestone at an altitude of 700 to 860 metres (2 300 to 2 850 ft.) in plateaus or broken slopes. The present area is about 2 650 hectares (6 545 acres), 650 hectares (1 605 acres) having been detached a few years ago for redemption of the rights of use on the part of the adjoining communes. The forest is well provided with roads: the departmental road, 50 kilometres (30 miles) of well planned paved forest roads, and 30 kilometres (18.6 miles) of natural earth roads for working and cartage. Several forest houses provide accommodation for the keepers. The forest masses are regular and finely grouped; the trees are big and high, some having 3.60 to 4 metres girth (140 to 156 inches) and being 250 years old. The building timber of a tree with a girth of 5 m. (195 inches) at 1.30 m. (about 4 ft.) from the ground, and a height of 50 m. (162 ft.) is estimated at 25 cubic metres (882 cub. ft). The annual exploitation of the forest is 10 cubic metres per hectare (142 cub. ft.), that is to say a total of 2 600 cubic metres (91 780 cub. ft.), representing a value of 500 000 francs (about £20 000). The system of treatment applied to the forest is the selection system, which, in addition to the removal of the matured trees, includes the successive improvement of the younger crops. Natural reproduction takes place very easily.

854 HUBERTY, F. **Cultivation and Manuring of Osier-Beds.** (Note sur la fumure des oseraies). — *Bulletin de la Société centrale forestière de Belgique*, 18^e A. 11^e-12^e Liv., pp. 697-702 + 781-789 + figs. 1-111. Bruxelles, Novembre-Décembre 1911.

Belgium

The author calls attention to the easy and profitable character of the utilisation of osier beds and suggests that serious efforts should be made to spread osier growing, which in Belgium only occupies about 5 000 hectares (12 500 acres).

From existing data it is found that a hectare of osiers produces the following net results:

France	fr. 300-400	£4 6s — £6 8s per acre
Russia	» 300-450	£4 6s — £7.2s »
Saxony	» 187-225	£2 19s 10*d* — £3 12s p. acre
Hanover	» 142-170	£2 5s 5*d* — £2 14s. 5*d*. »

According to official information supplied by the Dutch Government to the International Exhibition in Brussels, the average price of a standing 4 year old osier bed was 728 francs per hectare (£11 12s. 11*d* per acre) during the period 1884-1909.

From experiments carried out in Belgium it is ascertained that the cost of an osier bed is about fr. 800 (£12 16s per acre); in England, by the Thames, it is also from 800 to 1 000 fr. (£12 16s to £16 per acre).

As to manuring, it must be borne in mind that the osier contains 3.7 to 6 % of ash, which indicates that it may thrive in different soils, but if remunerative crops are desired, good soils are needed. If the produce of a good osier bed be fixed at 3 000 to 4 000 kg. of ry osiers per hectare (about 24 to 32 cwt. per acre) the soil would be deprived of the following quantities of nutritive substances:

	kg. per ha.	lb. per ac.
Phosphoric acid	15	13.39
Potash	18	16.07
Lime	20	17.86
Soda	10-11	8.93 — 9.82
Nitrogen	40-45	35.71 — 40.18

Although they are less than those required for farm crops, these quantities are none the less appreciable, and they prove the necessity of putting down manure, chiefly potash and nitrogen. Experiments confirm the special importance of nitrogen for osier beds, but it must be remarked that if it is put down in excessive quantities (beyond 150 kg., 134 lb. per acre, of nitrate of soda), there is the risk of fragile osier with excessive pith resulting.

The quantity of manure to be put down per hectare is said to be: 100 kg. (89 lb. per acre) of nitrate of soda; 200 kg. (178 lb. per acre) of kainit and 400 kg. (357 lb. per acre) of basic slag. Nevertheless in each case an analysis o the soil must be made and the results completed by comparative experiments; the latter, according to the results obtained by Dangeaux of Gembloux, could be suitably conducted in the following fashion.

Measure off 9 plots of 1 are (4 poles) each, apply the manure in February, embedding same by moulding up :

I plot	— 8 kg.	17.6 lb.	of basic slag
II »	— 2 »	4.4 »	of nitrate of soda
III »	— 30 »	66.1 »	lime
IV »	— 8 »	17.6 »	slag, 2 kg. (4.41 lb.) of nitrate and 30 kg. (66 lb.) of lime.
V »	— 30 »	66.1 »	lime, 4 kg. (8.82 lb.) of kainit and 2 kg. (4.41 lb.) of nitrate.
VI »	— 8 »	17.6 »	slag, 2 kg. (4.4 lb.) of nitrate and 4 kg. (8.82 lb.) of kainit.
VII »	— 4 »	2.8 »	kainit.
VIII »	— 8 »	17.6 »	slag and 4 kg. (8.82 lb.) of kainit
IX »	—		No manure

855 Busse, J. **Forest Weed Destruction by the Use of Caustics.** (Aetz (Düngungs-) Versuch). — *Naturwissenschaftl. Zeitschr. für Forst- u. Landw.*, 9 J., H. 12, pp. 552-560 + fg. 1. Stuttgart, Dezember 1911.

Germany : Prussia

The remarkable production of beech-mast in 1909, in Germany, did not give rise to the regeneration hoped for, chiefly in consequence of the weeds (Vacciniaceae and *Polytrichum*) which prevented the beech nuts from germinating in forests which had long ceased to be worked.

In order to destroy this injurious surface cover, mechanical means being too expensive, the author experimented with chemical agents capable, in addition, of fertilising the soil.

These experiments were carried out in a forest reserve for demonstration purposes belonging to the Forest Academy of Hanover-Münden, on 8 parallel sets of plots of 25 square metres (30 sq. yards). On these sets, each plot was subjected, on the 19th April 1911, to one of the following treatments:

Quicklime	kg.	10	22	lb
Kainit	»	5	11	»
20 % sulphate of iron solution . . .	»	5	11	»
« Masut » (crude petroleum)	»	6.75	14.85	»
« Florium » (soluble carbolineum) . .	»	1.25	2.75	»
Cresolate of soda	»	1.25	2.75	»
5 % sulphuric cresol	»	1.25	2.75	»

From the observations made up to the 11th October, it would seem that the most intense action was that of kainit, after which follow, in diminishing succession: sulphate of iron, cresolate of soda, sulphuric cresol, florium, crude petroleum and finally lime, which is said to have produced hardly any effect, perhaps owing to the small rainfall.

These different treatments cost as follows:

		per hectare		per acre
Lime	fr	120	£	1 » 18 » 4
Kainit	»	37.50	»	11 » 10
Sulphate of iron	»	100	»	1 » 12 » 0
« Masut »	»	490	»	7 » 16 » 9
« Florium »	»	250	»	4 » 0 » 0
Cresolate of soda	»	175	»	2 » 16 » 0
Sulphuric cresol	»	375	»	6 » 0 » 0

Consequently, even from the economic point of view, the superiority of kainit appears a proved fact, and thus kainit adds to the advantage of being caustic, that of being a fertiliser and easily administered.

F. LOMBARD. **The Costs of Public Administration and Supervision of Communal Forests**. (Les frais de régie et de surveillance des bois communaux). — *Revue des Eaux et Forêts*, T. L., I. L., pp. 4-11. Paris, 1er Janvier 1912. **856**

France

The French Forestry Department is on the point of reorganisation, and according to the Author this reorganisation requires unification of the staff, the duties of which would comprise:

1. A department of a general character: fishing, re-afforestation, clearing, etc., in addition to military duties.
2. Administration and supervision of State forests.
3. Administration and supervision of communal and departmental forests and those belonging to public bodies.

The last mentioned duties would represent at least one-half of the work of the staff; for this reason they require fitting remuneration from the bodies owning the forests which are subject to administration. The question consists precisely in determining this remuneration and fixing its bases.

The fundamental principles of this remuneration are set out as follows:

1. The costs of administration and supervision, which together form management expenses, represent a sort of guardianship and should, in principle, only be the actual expenses incurred by the State.

2. It being impossible to estimate the expenses correctly for each forest separately, the appropriation made by the State must be progressive in character.

3. The expenses of management must be set aside not out of the gross returns, but out of the net revenue.

4. Other conditions being equal, the costs of management are not proportional to the area.

5. The relative amount of the costs of management diminishes with the increase of net revenue per hectare.

6. From the last two preceding paragraphs it follows that neither the area nor the relative value, *i. e.* the net revenue per hectare, which are the factors constituting the total reveuue, can, without proper correction, serve as a basis for the appropriation of management expenses.

As regards the methods of appropriation proposed, the Author makes the following considerations:

a) Method of exact repayment of the management expenses, inapplicable in practice besides presenting every likelihood of being a burden on the State.

b) Repayment by unlimited appropriations of a percentage out of the total revenue, in spite of its simplicity and consequent popularity, is inapplicable to a country where the communal forest unit is exceedingly variable, as in France, both from the point of view of area and of revenue per unit of area.

c) Repayment by an appropriation of a uniform percentage out of the total revenue limited to a maximum per hectare would favour the best forests.

The Author, on the contrary, proposes a method of payment of these expenses on a decreasing rate basis.

Let $r_1 < r_2 < r_3 \dots < r_n$ be the total average revenues of n communal forests and $s_1, s_2, s_3 \dots s_n$ the average costs of management; we have:

$$\frac{s_1}{r_1} > \frac{s_2}{r_2} > \frac{s_3}{r_3} \dots > \frac{s_n}{r_n}$$

The law of increase of the numerators can however only be determined by complete statistical data; but it may approximately be assumed tnat the costs of management will be proportional to a value intermediate between the total revenue and its square root, for instance to a revenue having $\frac{1}{x}$ as its fractional exponent, so that we should have

$$s_1 = kr_1^{\frac{1}{x}},\ s_2 = kr_2^{\frac{1}{x}},\ s_3 = kr_3^{\frac{1}{x}},\ \ldots\ldots\ s_n = kr_n^{\frac{1}{x}}.$$

Then taking two equations, for instance

$$s_2 = kr_2^{\frac{1}{x}} \text{ and } s_5 = kr_5^{\frac{1}{x}}.$$

we can extract the two unknown quantities:

$$x = \frac{\log.\ r_5 - \log.\ r_2}{\log.\ s_5 - \log.\ s_2}$$

$$\log.\ k = \log.\ s_2 - \frac{\log.\ r_2}{x}$$

The Author concludes by expressing the opinion that it is possible and even probable that the variation in the rate of the costs of management differs from that indicated, whether represented by a logarithmic curve, a regular curve or simply an empirical curve, but in any case statistics will confirm that the percentage of the expenses of management decreases with the increase of revenue, which would justify the method of the decreasing rate proposed by him.

LIVE-STOCK AND BREEDING

HYGIENE OF LIVE-STOCK

857 **Injury to Live-Stock from Ergot on Grasses**. (Ergot). — *The Journal of the Board of Agriculture* Vol. XVIII, No. 9, pp. 762-763. London, December, 1911

Great Britain

Although ergot (*Claviceps purpurea* Tul.) has been almost totally eradicated from cereal crops, it is abundant on many wild grasses in Great Britain and undoubtedly proves highly injurious to cattle.

The subject has been most exhaustively investigated in the United States. A serious epidemic of cattle, at first considered to be foot-and-mouth disease was proved to be caused by ergotised food. Abortion also frequently occurs when cattle graze in pastures where ergot is abundant.

Eradication of this pest turns entirely on preventive methods. Keeping grass cut to prevent flowering for two seasons, practically eradicates the fungus. Special attention should be paid to wild grasses, growing in ditches, hedges, headlands, etc. A goat kept with stock is of service, and has alone in some instances prevented injury to stock, as goats eat ergot without harm.

858 · FULLER, V. A. **The Spontaneous Oxidation of Arsenical Dipping Fluids**. — *U S Dpt. of Agriculture, Bur. of Animal Industry, Circ.* 182, pp. 8. Washington, November 9, 1911.

United States

The observation having been made that in several instances batches of used dip which had been allowed to stand in the vats for varying periods of time showed an apparent loss of arsenic, a special study was undertaken by the author to determine the conditions under which this loss take place (1).

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(1) See *B.* Jan. 1912 No. 146. (*Ed*).

From the results it may be concluded .

I. Sodium arsenite may undergo oxidation to arsenate through the agency of a micro-organism or organisms not yet identified.

II. This oxidation may be quite rapid and in time proceeds practically to completion. The velocity of the reaction is dependent upon the number of the organisms introduced and upon their rate of multiplication, the latter factor being determined by the nature and quantity of organic matter present, the temperature, and all the agencies which influence bacterial growth.

III. Inasmuch as the organism or organisms in question have not as yet been identified, it is impossible to state just how they gain access to the baths. There are several channels through which the inoculation might be effected, through the water used, through the air, or through matter derived from the cattle passing through the dip.

IV. In view of the fact that the conditions to which the baths are exposed in actual practice are necessarily subject to wide variations, it is difficult to set a limit to the time which a given dip might be allowed to remain idle without undergoing alteration. However, it would appear safer to discard any batch of dip which is more than a few weeks old unless there is positive evidence that it retains its original concentration of actual sodium arsenite.

Efforts will be made by the author to isolate and study the causative agent of this phenomenon.

The Sheep Tick. Its Life History. — *The Pastoralists' Review.* Vol. XXI, No. 9, pp. 954-955 Melbourne, 15 Nov. 1911. **859**

Tasmania

Experiments carried out in Tasmania have shown that the pupae of the Sheep Tick (*Melophagus ovinus* Lab.) emerge from the chrysalis stage on the 21st day after birth. This was ascertained by means of an incubator, in which the development of more than 50 pupae of different ages, at a temperature of 35° C., was kept under observation.

In two other experiments, fully grown ticks were taken from the fleece of sheep and placed on a sod of turf, being prevented from escaping by a zinc cylinder of 27 inches in circumference and 7 inches in height embedded in the ground. As early as the second or third day they died. This would show that the tick can only live a very short time if removed from its usual habitat.

The occurrence of puberty was observed only in a couple of ticks; on the 12th day of life the female laid the first pupa.

To kill ticks in great number on a freshly sheared sheep and another with wool, immersion of the sheep for one minute in water to which arsenic powder had been added was sufficient. Both sheep were kept in quarantine for 11 months after the treatment. After that time they had fine fleece and remained free from ticks.

ANATOMY AND PHYSIOLOGY.

860 BELL, MRS. ARTHUR. **Abbott Thayer's Basic Principles of Protective Coloration in the Animal Kingdom**. — *Science Progress*, Vol. VI, No. 22, pp. 210-220. London, October 1911.

Great Britain

Speculation on the subject of protective coloration in the animal kingdom has till recently proceeded on four great assumptions. These are: the principle of the Survival of the Fittest or Natural Selection, the principle of Sexual Selection, the principle of Protection by means of Mimicry and the principle of Protection by means of Concealment.

That is to say, it has been taken as proved that different colours and hues have been developed in animals by two main processes, for two main purposes. The first process is the survival of those most able, thanks to peculiarities of coloration, to conceal or disguise themselves, either from their enemies or from their victims and the consequent transmission of these peculiarities to their offspring.

Over against this process, however the followers of Darwin have assumed that another great force was at work, a force making not for, but against protective coloration: this is the tendency of females to choose their mates from among the more brilliantly coloured or marked males who compete for them, and thus favour the transmission to succeeding generations of peculiarities selected not because they increase the safety, but rather the conspicuousness of their possessor.

Hence the existence of highly coloured species is accounted for despite the fact that brilliance of colour has been assumed to be the very reverse of a protection to its wearer.

Of these four principles only two are thoroughly accepted and endorsed by Thayer: the whole trend of the evidence which he has collected is towards the most drastic modification, if nothing more, of the remaining two.

Natural selection is the process and concealment is the purpose of animal coloration. Coloration for him means in the animal kingdom concealing coloration. Now, it will be evident that the strength of Thayer's case lies in proving that animals are much better hidden in their natural surroundings than the ordinary observer imagines.

With the governing purpose of making living forms indistinguishable from their normal background, the development of animal coloration has, according to Thayer, been, so to speak, directed by three great principles which he calls respectively those of « Countershading » those of the « Averaging of the Background » and those of the « Obliteration of Outline ».

In these three principles lies the key to the whole subject. The principle of Countershading is Thayer's cardinal discovery; shading, he says, is really more important than colour, because it is primarily an attribute of form while colour is only secondarily so.

The fact that the great majority of living species are shaded more heavily on the back and lightly on the belly is evidence of the working of the principle that animals are painted by Nature darkest in those parts which tend to be most lighted by the sky's light and vice versa. The object is to create a gradation of shading counter to the gradation of shading which light thrown upon the object would produce and having the same note of gradation, with the result that the object appears perfectly flat, retaining its length and breadth but losing all appearance of thickness. The principle of Averaging of the Background again gives a new significance to coloration proper. Thayer claims that on animals which need the highest degree of inconspicuousness there has been developed a sort of compound picture of their normal background, a picture seemingly made up of the averaging of innumerable backgrounds. Moreover, the way in which dashes or gradations of colours are distributed on the animal's coat is used to help forward the work of countershading, to emphasise the illusion of flatness to make the animal resemble not an object, but a background seen in perspective. Patterns on animals' coats are thus the utmost that Nature can do against what Thayer calls the « patent vicissitudes of silhouetting" which follow from the animal moving about against a variety of backgrounds. But the really protective scheme goes farther still, and definitely aims, so to speak at merging itself into the background so that the outline of the animal is completely obliterated. Anything which breaks up or cuts into sections the surface of the animal's form makes against the possibility of recognising it as what it is.

Thoroughly to understand that system, it must also be remembered that the protective schemes of the animal creation have very seldom been elaborated to hide them from man. Thus since there is no such thing as " complete intrinsic inconspicuousness " the only way to appreciate an animal's means of concealment is to learn to see it against its normal background and from the position and angle of its most dangerous enemy or favourite prey.

361 BORGEAUD, A. **The False-Rib**. (La fausse côte). — *La Terre Vaudoise*, 3ᵉ Année, No. 50, pp 455-456. Lausanne, 16 Décembre 1911.

One remembers the discussion raised by the late Dr. S. Bièler, in 1895, in the *Chronique agricole* of the Canton of Vaud, on the subject of the false rib. The interesting statements he then made
tzerland have not, however, entirely solved the problem, and a great many
rance zoologists and practical men cannot yet be persuaded that the false rib is a sign of improvement, being considered as a 14th supplementary rib which increases the length of the much prized sirloin.

Amongst others interested in the question, Dr. Pagès, chief anatomist in the sanitary service of the department of Seine, publishes the results of his observations, which raise fresh questions of interest.

He states that in every case observed by him the number of ribs was normal, *i. e.* thirteen, and this last rib was imperfect. Dr. Pagès remarks on the confusion that prevails in every discussion relating to this problem, because of incapacity to distinguish between insufficient development of the 13th rib and the formation, rare in the ox, but frequent in the horse, of bony blades sometimes found attached to the extremity of the transverse apophysis of the first lumbar vertebra. He proposes to call *imperfect* or *floating* a rib unconnected with the others, and *false rib* the bony blades hanging at the end of the tranverse apophysis of the lumbar vertebrae.

The population of Auvergne are the sworn enemies of what they call " le coustelou " or small rib. To them it means that the animal is unfinished and will never develop as well as others. According to Dr. Pagès it is not to be found in animals with a rounded chest and wide, strong haunches, but only in those that appear flat and thin in that region; so that he will often undertake to judge, from the external appearance of an animal seen from a distance, whether he is in possession of a false rib. It is also a question of race; the Ardennes cattle being especially liable to it.

It is interesting to find that the false rib is known to doctors. In fact a normal man has 12 ribs, the two last of which are floating; now cases have been noticed in which the 9th and 10th ribs are also floating. This is a very defective conformation, being often accompained by the displacement of the chief abdominal organs.

Dr. Pagès affirms on the other hand that the defective rib is more often found in deep-milking cows than in others, all other conditions being equal, this would mean an additional milking character. He explains it in the following manner: when a breed of cattle is very specialised for milk production the bony and other tissues suffer from this specialisation and the bones become thinner and more brittle. The defective rib is a result of this condition of the framework.

Dr. Pagès arrives at the following conclusions:

1) The floating rib indicates arrest in the last phase of the development of the frame.

2) It is detrimental to general vigour in animals as in man.

3) It is to be condemned in beasts of burden as in those intended for food.

4) It may be songht after in milch cows in the case of having little room to dispose of, or of the price of food and other expenses of production being high as in large towns (this of course applies to private cases only).

5) From the point of view of improvement of breed, it must be entirely eliminated; every kind of specialisation made at the expense of good formation and general vigour is bad.

As regards the milk producing faculty, for instance, the problem consists in developing it as highly as possible with as little possible damage to general strength and above all to the meat.

Dr. Pagès' observations are interesting but need modification; it would be particularly interesting to determine whether the imperfect rib is more frequent in purely milk breeds than in general-purpose ones, such as the Swiss red-spotted breed.

FEEDS AND FEEDING.

FINGERLING, G. **The Protein Requirements of Growing Cattle.** (Der Eiweissbedarf wachsender Rinder). — *Die landwirtschaftlichen Versuchsstationen.* Band LXXVI, Heft I und II, pp. 1-74. Berlin, 1912. 862

The Author endeavoured to ascertain whether the proportions of protein specified by Kellner in his feed rations suffice for young Germany growing animals, whether an increased supply of protein can produce a greater gain in body weight and whether a lesser quantity than that indicated by Kellner retards the growth of young steers.

He carried out his experiments during the years 1908 to 1910 on 3 bull calves aged 4-5 months at the beginning of the experiment and one 7 months old steer (all of them Simmental cross-breds), at the experimental Station of the High School of Agriculture at Hohenheim.

The chemical composition of the foods given the animals was ascertained before beginning the experiments, and, by means of accurate analysis of the urine excreted and of average samples of the dung taken daily, it was determined what proportion of protein, contained in the food, had been digested, how much had gone to form body substance, and what quantity had been decomposed by metabolism and passed out in the urine.

The bulk of the fodder given was either hay alone, aftermath alone, or hay and straw; and along with these sugar, oil of sesame, gluten and starch, were fed. By increasing or reducing one or several of the last mentioned substances in the ration, the latter was made sometimes richer, sometimes poorer in protein in the different periods. Each experiment covered one week to 20 days. Between each two periods of experiments with the same animal transition periods were interposed.

The results of the experiments were as follows:

1. Young and growing animals of a precocious breed, when given about 1.5 lb. of protein per 1000 lb. live weight, put on about the same amount of body weight as when fed with much larger quantities of protein, if a sufficient proportion of starch was present in the ration.

2. The total of starch values prescribed by Kellner for growing animals cannot be reduced without detriment.

3. Increased supplies of protein only increase the metabolism of protein but not its assimilation.

The Author does not think it desirable to give less protein than specified by Kellner, because the lower limit in agricultural practice is not so easy to ascertain, and because on the other and from his experiments the effect of lower doses of protein on the quality of meat and breeding value is not manifest.

We give below an extract from the tables appended.

Calves	Period	Daily digestible protein	Daily starch value	Proportion of protein	Daily gain in live weight
		Per 1000 lb. live weight			
		lb.	lb.	1 :	lb.
	I	2.385	12.81	5.94	1.62
	II	1.345	12.22	10.72	1.53
B	III	0.680	12.15	22.70	0.66
	IV	0.607	11.78	24.34	0.81
	V	0.571	11.62	24.75	0.88
	I	2.886	14.89	5.67	1.54
	II	1.605	13.60	9.85	1.62
C	III	3.310	14.17	4.39	1.50
	IV	0.726	13.76	23.46	0.59
	V	0.616	13.01	25.48	0.77
	I	1.819	11.33	7.38	1.05
	II	1.866	11.88	7.30	1.17
	III	1.086	9.66	11.07	0.87
G	IV	1.038	10.54	12.39	1.51
	V	0.962	9.93	13.06	1.29
	VI	0.478	9.74	23.09	0.47
	Preparatory period	3.178	13.45	4.18	1.19
	I	1.709	13.03	8.16	0.97
H	II	1.646	13.38	8.69	1.24
	III	1.579	13.49	9.13	1.24
	IV	1.565	13.69	9.30	1.51
	V	1.514	14.00	9.84	1.24
	VI	1.512	14.18	9.96	1.38

368 WOLL, F. W. and HUMPHREY, G. C. **Studies of the Protein Requirements of Dairy Cows.** – *Twenty-seventh Annual Report of the Agricultural Experiment Station of the University of Wisconsin*, pp. 175-216. Wisconsin, 1911.

United States

The question whether high or medium doses of protein are preferable for dairy cows had mostly been dealt with up to now by experiments of short duration or on a few animals; the authors therefore undertook to ascertain by means of a nine years' practical feeding test, extending from 1900 to 1909, in the Dairy Cattle herd of the University of Wisconsin, to which kind of fodder preference was to be given. The 9 years were divided into 3 periods:

A - 1900-1903
B - 1903-1906
C - 1906-1909.

Each year consists of a summer feeding period (from about 15th May to 15th November) and a winter feeding period (15th November to 15th May).

In periods *A* and *C* the animals were given fodder on the average poorer in protein and richer in non-nitrogenous substances than the fodder in period *B*. The bulk of the fodder consisted of maize silage, clover hay and timothy hay, green fodder mangolds, and other roots, for some time lucerne was also given. In the summer the animals were turned out on to pasture land, which however supplied them with very little nutriment; they received their chief feeding in the shed. The concentrated foods supplied in periods *A* and *C* consisted chiefly of grain or easily obtainable commercial foods; the average nutritive ratio in these two periods was 1:7 and sometimes even less. In period *B*, commercial fodders richer in protein, such as oil cakes and brewers' draff, were fed to the animals, so that the nutritive ratio averaged 1 : 6.

In no period was the food of all cows exactly the same; the feeding was individual. Cows showing a greater tendency to put on flesh were given food richer in protein than pronouncedly milk-secreting cows, and very good milkers were more amply fed than those of poor yield. The guiding idea was to obtain the greatest output from each cow with the least expenditure.

As it is not possible to keep all the animals of a dairy herd for 9 full years, only the data obtained in respect of 27 cows can be used to draw conclusions from the experiment. These were 6 Dutch cows, 8 Jersey, 5 Guernsey, 3 Shorthorn, 1 Schwyz, and

1 Red Polled. Only 7 of them could be tested in all three periods; the rest were either on hand only during periods *A* and *B* or during periods *B* and *C*. The average results of the experiment do not speak in favour of a very large nutritive ratio (1 : 6 and more), because with a few exceptions, with a ratio of 1:7 and less (periods *A* and *C*) the milk and butter yield of the cow was not only just as great, but somewhat greater than during the period B. The increase in live weight of the animals averaged somewhat more in period *B* than in the two other periods, but the authors think that this is not a consequence of the feeding, but of the fact that in this period many cows reached their best time of life.

The authors conclude from their experiments that for many farmers in the North-West of the United States who keep their cows under quite similar conditions to those present at the experiment, the administration of feed rations of average protein contents is most advisable.

BREEDING.

WILSON, JAMES. **The Value of Pedigree.** — *Live-Stock Journal Almanac for 1912*, pp. 104-106. London, 1912 **864**

Great Britain

The money value of pedigree is well seen at sales of all kinds of pure-bred stock; but in some kinds the buyer goes further back than in others. In horses, for instance, the appearance of the animal itself counts for more than its pedigree. Even in race-horses, which have very long pedigrees, they are seldom written up beyond five or six generations; whilst the purchaser only requires to know the sire and dam, or if the dam has no record, he will want to know her sire and dam.

Cattle-buyers are much more influenced by the remoter individuals in a pedigree. Aberdeen-Angus and Shorthorn breeders in Scotland go back half a century to celebrated ancestors, and some Shorthorn men even to Bates and Booth animals. Part of the reason for this is the value put on these long pedigrees by American buyers.

In considering the true value of pedigree, it must be remembered that the descendants of any animal may lose or gain characters at each generation: the descendants of a great animal may become worthless by reason of the way they are mated; the descendants of a poor one may become great.

The rendering of pedigrees by families is liable to be misleading. Thus, at Ballindalloch "there are half-a-dozen families that have been in the herd for five-and-thirty years and over. The Lady Fannys, Coquettes and Nosegays had been there from time immemorial; Erica was introduced in 1861, Jilt in 1867, Miss Burgess also in the sixties, and Pride of Mulben in 1876. These and their female descendants have been put to practically the same stock bulls right down to the present day; and who will now go into the herd and, without knowing the individual animals, say, by a searching examination, which are of one family or which of another?" The bulls now to be seen in this herd do not belong to any particular family, but are the selected extracts from the bulls that have been at Ballindalloch for the last forty or fifty years. The pedigree thus written through the dams is only a very partial representative of the animal's true pedigree, "the essential part being that which contains the ancestry in full for the latest generations, namely the parents and grand-parents; then their predecessors in constantly lessening importance according as they fade into the past".

In Aberdeen-Angus cattle a hundred years ago there were several colours besides black; nowadays red is the only one that ever crops up. The reason is that when red and black cattle are mated the calves are black, though they contain the red colour and the power to reproduce it: the red is masked by the black. As it was, and still is, impossible to distinguish black animals containing red from pure blacks, the breeders who were attempting to eliminate red could only proceed by ceasing to breed from red stock and from animals that got red stock. By this means the chances of getting a red calf have been so reduced as to be very small indeed. If Aberdeen-Angus breeders had wished to get rid of the black colour, they would have had no trouble, for red parents never get black calves. "It is easy to eliminate a masking character, but difficult to breed it pure; and it is difficult to eliminate a masked character, but easy to breed it pure".

Among horses there are half-a-dozen colours, *viz.* grey, dun, brown and bay, black, and chestnut; grey masks all that follow it, dun all that follow it, and so on down to chestnut, which masks nothing. All these colours occurred in thoroughbreds in the eighteenth century; but dun and grey became unpopular, and duns have now disappeared, while greys have been kept up by the occasional use of a grey horse for breeding. The brown, bay and chestnut which were preferred, did not mask or contain dun, so that it could not reappear.

On the other hand Clydesdale breeders wanted brown and bay; these colours may mask chestnut, and so there was some difficulty in eliminating this colour, which occasionally appears even at the present time.

Another case of the difficulty of eliminating a masked character is that of horns in cattle, which is masked by hornlessness; it was long before Aberdeen-Angus breeders could get rid of it, and the breeders of polled Durhams and Herefords in the States are having the same difficulty now.

The chestnut colour of the Suffolk Punch has been easy to obtain, as it masks nothing.

Many other cases are known of characters which run in pairs, a masking and a masked; some, however, behave differently, such as the three Shorthorn colours, the colours of blue-greys and of their parents, and the yielding power of milch cows. Breeders should endeavour to find ont these pairs and their behaviour.

If it is found that cattle with well-sprung ribs occasionally produce flat-ribbed calves, then the round ribs mask the flat, and it will be difficult to breed the former character: a round-ribbed ancestry for several generations is a certain amount of security; but if one or more of the recent ancestry have produced a single flat-ribbed animal, then their progeny is under suspicion.

If it is found that a breed like the Aberdeen-Angus or Galloway reproduces its round rump when mated with square rumped Shorthorns, then the round rump masks the square; and breeders of square-rumped cattle will have difficulty in putting round rumps on the square-rumped breed.

If clean-legged horses get clean-legged foals from hairy-legged mares, then the hairy legs are masked by the clean, and the breeders of hairy-legged horses will have no difficulty in keeping the hair on their breed; but if they wish to take it off, they will have to weed ont not only every animal with hairy legs, but every animal that produces such offspring.

WORK OF LIVE - STOCK ASSOCIATIONS AND OTHERS FOR ENCOURAGEMENT OF BREEDING

365 **Committee on the British Export Trade in Live Stock.** — *The Journal of the Board of Agriculture*, Vol. XVIII, No. 9, pp. 769-771. London, December 1911.

Great Britain

In the Report recently issued by the Departmental Committee appointed by the President of the Board of Agriculture and Fisheries to inquire and report as to the British Export trade in live stock with the Colonies and other countries, the Committee makes the following recommendations:

1. « The export of inferior or unsuitable pedigree stock should be discouraged ».
2. « In the appointment of consuls to certain districts a knowledge of British live stock should be taken into consideration ».
3. « The Intelligence Division of the Board of Agriculture and Fisheries should be enlarged so as to provide a Bureau of Information for increasing the facilities as regards the export of pedigree stock ».
4. « The official volume entitled *British Breeds of Live Stock* should be supplied to British consuls and presented to representative agricultural bodies in certain countries ».
5. « Official encouragement and assistance should be given to the system of keeping milk records ».
6. « It is desirable that, in the case of countries where exporters of British live stock find difficulties to exist in connection with the tuberculin and other tests, the Government of each country concerned should in the first place be invited to appoint an official in this country for the purpose of testing animals before exportation; as the American and Australian Governments have already done. In the event of any Government declining to adopt this proposal, steps should be taken to ascertain whether the authorities concerned would recognise a certificate issued at a Government testing station in this country, and the Committee recommends that an official testing station (or stations) should be established accordingly, if the exportation of live stock now, or in the future, would seem to justify the capital and annual expenditure necessary ».

7. « There should be no relaxation of the existing live stock import regulations which tend to prevent the introduction of contagious animal diseases into this country ».

8. « Official assistance should be given for research work as regards the prevention and cure of contagious animal diseases ».

9. « If the existing law is insufficient it should be strengthened in order to penalise a person who treats an animal so as to falsify, or with intent to falsify, the result of a test by inoculation or otherwise which is required by a statute or regulation or otherwise, or with intent to defraud, causes any test to give a false result ».

10. « The attention of veterinary institutions which grant diplomas in this country should be drawn to the importance of providing thorough instruction in the application of the tuberculin test ».

11. « The law should be strengthened, if necessary, in order to penalise a person who obtains by false pretences a certificate of registration of an animal, or who fraudulently uses any such certificates ».

12. « Exporters should consider whether they would prefer any reasonable alternative to the present system of charging for the carriage of live stock by passenger train, forwarding their agreed suggestions to the railway companies either directly or through the Board of Agriculture and Fisheries ».

13. « Exporters should *a*) consider the rates charged for single animals sent by goods train; and *b*) ascertain whether stock is conveyed by the shortest route, and whether the charges are based on the shortest route; and should, if necessary, communicate with the railway companies, either directly or through the Board of Agriculture and Fisheries ».

14. « The Board of Agriculture and Fisheries should request the Breed Societies to draw the attention of their members to the fact that the Board are prepared to investigate complaints as to excessive railway charges or insufficient facilities ».

15. « Official action should be taken against Shipping Combines when necessary to prevent any prejudicial effect on the export of live stock owing to the system of deferred rebate ».

16. « It is desirable that the Governments of certain countries which import British live stock should be approached with the view of securing their acceptance of official export certificates issued by the Board of Agriculture and Fisheries ».

866 VAN DAMME, C. **Zootechnical Investigations made at the Breeding Station of Zambi in the Belgian Congo.** — *Bulletin agricole du Congo Belge.* Vol. II, No. 4, pp. 279-296. Bruxelles, Décembre 1911.

Belgian Congo

The Station for Zootechnical Investigation at Zambi (Lower Congo) at present possesses about 600 head of cattle, 200 horses and asses, goats, pigs and a considerable number of poultry. The object pursued is selection of native breeds and their improvement by crossing them with animals imported for reproduction.

The first Belgian bulls were sent to Zambi in January 1909. The results obtained from crossing them with native cows were so satisfactory that a second consignment of bulls was despatched at the end of 1910. Experiments in reproducing pure-bred Belgian cattle have also been made there and the calves are in a thriving condition. Besides this about 50 animals of the Dahomey breed, recently sent to Zambi, will serve to show whether the species is adapted for the Colony of the Congo. In Dahomey the cattle are small in size (from 1.1 to 1.2 metres, 42.9 to 46.8 inches, high at the withers) and black in colour on reaching maturity; they are considered to be very hardy and very small feeders, although they fatten easily and give an excellent quality of meat.

At the present time a special study is being made of a number of Indian Zebus as well as of some tame Buffaloes imported from Italy. Experiments are also being made in the acclimatisation and reproduction of European asses, besides the production of mules from young Belgian mares of small stature and Italian asses.

The results obtained in breeding the improved Belgian pigs are so satisfactory that it has been decided, before long, to spread the race among the native populations.

867 **Stud Stock Fair at Bloemfontein.** — *The Pastoralist' Review,* Vol. XXI, No. 9, p. 1001. Melbourne, 15 November 1911.

South Africa

The Stud Stock Fair held in September 1911 in Bloemfontein was attended by about 1 000 farmers. The city of Bloemfontein is, by its geographical situation, marked out for events of this kind, and is becoming more and more the centre of South African Stock breeding. The demand for good stud stock was exceedingly brisk. Cattle were present in large numbers, and among them chiefly the Frisian strain. The highest price for a Frisian bull amounted to fr 3 900 (£ 154 8*s*). Shorthorns and South Devons were also much in demand, but the supply was small. The maximum price for a two-year old Shorthorn Bull was fr. 2 340 (£ 92 12*s*).

The demand for sheep was inconsiderable; few sheep-breeders attended the fair.

The Percheron Stallion " Hectometre ", imported from France was awarded a prize of fr. 5 850 (£ 231 12*s*).

HORSES.

LEJEAUX, JEAN. **Farm Horse Breeding.** — *La Vie à la Campagne* Vol. X, No. 125, pp. 313-315. Paris, 1 Décembre 1911. **368**

Algeria

Draught animals in North Africa being too small to draw heavy loads or carry out field work, a good draught horse must be obtained. In the Domain of Aliah-Planchamp, in the valley of the Saf-Saf, M. Barrot has, for the last 12 years, been engaged in producing this horse, which is demanded by North African agriculture.

The process of selection being too lengthy, and very difficult to carry out under the economic conditions of the region in question, M. Barrot decided to cross his Berber mares with Percheron stallions. Every three years the stallion is replaced by a fresh one.

From the very first generation the offspring of the Breton stallion and the pure Arab mare was, at the age of three years, 5 cm. (2 inches) higher and 80 kg. (176 lb.) heavier than the dam. The type in the third generation represents products of fine powerful build, strong neck, prominent muscles, massive legs and well developed chest At the present time these horses carry out the heaviest farm work. They are fed on produce of the estate.

Foals live with their dams up to the age of 7 or 8 months, and are afterwards separated. The colts are then castrated, and the best fillies are reserved for reproduction. At the age of 3 years the young cross-breds begin to render appreciable service in the shaft and in light ploughing work. At 5 they are full grown, and can draw loads of 2 500 kg. (49 cwt 12 lb.). At the present time the animals of the third generation have an average weight of 550 kg. (10 cwt. 92 lb.) and are 1.60 m. (16 hands) high. We may add that the heavy Aliah horses do not suffer in the least

The weight of the Simmenthal-Reggiano calves at birth.

A systematic examination of the reports of the Simmenthal-Reggiano Herd Book for Simmenthal-Reggiano cross-breds gave the following results: out of 103 calves, male and female, there was an average weight of kg. 40.625 (89.5 lb) with a regular and uniform conformation in 80 individuals; with considerable development of the pelvis disproportionately to the weight of the foetus in 15 subjects; with very large head in 8 calves only. Out of 103 cases observed, calving was regular in 70 cows, laborious in 20, abnormal in 13, with 3 cases of death, due however to uterine infection.

The excess of weight of the cross-breds over the " Reggiani " is essentially gr. 965 (34oz) a weight which evidently can give rise to no judgment as to the course of calving, but which proves a better and more regular development, which is a certain indication of success in the rearing of the calf.

The weight of the Simmenthal and Schwyz calves at the age of 12 months.

The tables drawn up by the author show that the monthly increase of weight in 8 Simmenthal calves bred at the Zootechnical Institute, during 12 months, was kg. 31.550 (69.5 lb) per calf, which, disregarding sex, gives an average weight, at the end of one year, of kg. 438 (965 lb) per head. In the Schwyz strain, on the contrary, there was an average monthly increase during the first year of existence of kg. 27.919 per head, without distinction of sex, with an average of kg. 373 (822 lb) per calf at the end of the first year.

The production of milk and girth of the thorax in cows.

From measurements made by the writer on milch cows at the Zootechnic Institute, of different breeds and ages, it is found that highest yields of milk correspond to the largest girths of the thorax and the greatest live weights of the animal.

The expulsion of the afterbirth in cows.

From the figures cited in a special table it is found that out of 22 cows, without distinction of strain or age, the complete expulsion of the after-birth generally took place, at the Zootechnic Institute, 5 hours after calving, without appreciable difference in relation to the sex of the calves.

State of teeth in Simmenthal and Schwyz calves at birth.

In the Zootechnical Institute of Reggio Emilia, at every calving, there is registered in the calving book, the presentation of the calf, the course of calving, the weight, condition of teeth and time of intervention of the operator on the female. From a study of this book the author was able to make the following observations:

Out of 23 Simmenthal calves male and female, there were:

12 subjects with 8 incisors after 299 ½ days of gestation
10 » » 6 » » 279 » »
1 » » 1 » » 275 » »

Out of 23 other calves of Schwyz breed; without distinction of sex, there were :

4 subjects with 8 teeth after 288 days of gestation
14 » » 6 » » 282 » »
5 » » 4 » » 282 » »

Observations in connection with Yorkshire pig breeding.

The observations of the author relate to the first appearance of heat in the young sows, the figures given on this subject by different writers diverging very much. Keeping to the pure Yorkshire breed, to which the subjects examined and methods of breeding belong, he considers the following results reliable:

Out of 27 Yorkshire sows ;

9 showed the first heat at 4 ½ months
14 » » » 5 »
4 » » » 6 »

As to the duration of the rut, the author states that in Yorkshire sows it is usually 6 days and the typical average return of the heat in these sows takes place at the end of 19.5 days, with normal fluctuations of 2 to 3 days. These figures do not avail for the first reappearance of the heat after parturition. An interesting observation, which is not recorded in the books, but which the writer was almost always able to make upon the sows in the Institute, is the pretty clear manifestation of the rut on the second or third day after parturition. These phenomena last 1 or 2 days and recur regularly at 35 to 40 days' interval after parturition.

As to the length of gestation, the writer reproduced the data collected during 184 gestations and accurately checked; they give an average of 114.7 days, with a maximum of 122 days and a minimum of 109 days.

As regards the proportion of the sexes, contrary to the observations hitherto made, it would appear from these data that the males were more numerous. The average litter in primiparae was 9.8 for 30 sows.

871 STARZI, Dr. ALFREDO. **Cattle Breeding in Latium.** (Roma, il Lazio e la crisi della carne). — *Bollettino quindicinale della Società degli Agricoltori italiani*, Anno XVI, N° 23, pp. 901-911. Roma, 15 dicembre, 1911.

Italy: Latium

In Latium, large estates are more general than small ones, and the rearing of cattle in the open field more usual than under cover. In point of extent the estates on the Roman Campagna (" Agro Romano ") may be subdivided as follows:

		hectares	acres
From 1 to 25 ha	estates 43 total	517	1 276
» 26 » 50 »	» 21 »	760	1 877
» 51 » 100 »	» 31 »	2 761	6 819
» 101 » 200 »	» 24 »	4 109	10 149
» 201 » 300 »	» 34 »	8 139	20 103
» 301 » 400 »	» 24 »	9 293	22 953
» 501 and upwards	» 19 »	18 224	45 013
Total number of estates: 202	Total area.	43 803	108 190

Latium, which in 1881, possessed 49 288 head of oxen, had 131 515 in 1908. But the increase in cattle was not in proportion to that of the population nor, what is more significant, in proportion to the increased consumption of meat. The greater part of the oxen slaughtered in Rome come from other provinces or from abroad as will be seen from the following table:

Place of origin	1910	1901-1910
—	—	—
Tuscany	9 239	105 574
Umbria	6 643	101 694
The Marches	8 229	87 340
Latium	6 010	71 171
Sardinia	12 708	68 282
Naples	1 799	26 993
Romagna	3 151	19 899
Emilia	2 067	17 101
Venetia	1 086	9 005
Piedmont.	1 350	3 622
Abbruzzi	776	2 518
Servia	4 927	7 219
Argentine Rep. . . .	245	676
Rumania	24	393
Hungary	23	300
Calabria	—	38

The price of meat has steadily increased for the last ten years; Tuscan and Umbrian cattle, (oxen, cows and bulls) as well as those of the Marches, were worth from 90 to 175 francs per quintal (36*s* 2*d* to 70*s* 4*d* per cwt) of dead weight in 1901, and from 170 to 210 francs (68*s* 5*d* to 84*s* 6*d* per cwt) in 1910, the cattle of Sardinia and other provinces were worth from 90 to 125 francs per quintal (36*s* 2*d* to 50*s* 3*d* per cwt) dead weight in 1901 and from 145 to 180 francs (58*s* 4*d* to 72*s* 5*d* per cwt) in 1910; calves worth from 120 to 200 francs (48*s* 3*d* to 80*s* 6*d* per cwt) in 1901, were worth from 180 to 280 fr. (72*s* 5*d* to 112*s* 8*d* cwt) in 1910.

Oxen killed in Rome and reared in Latium belong for the most part to the Roman breed of the Latian plains, the rest being of the hill race, both of these running loose all or most of their lives, as well as of the Swiss-Lombard, Schwyz, Simmenthal and even Dutch breeds of cows, some of the latter having been recently reared for the production of milk.

In the case of the non-domesticated cattle of the plains, the weight of the live bull varies from 7 to 8 quintals (13.72 to 15.7 cwt) while the cows and oxen weigh from 5 to 6 ½ qls (9.8 to 12.74 cwt); the average amount of offal is from 48 to 52 %.

The custom is to fix the prices according to the live weight, which in 1901 was worth about 60 fr. a quintal (24*s* 1*d* per cwt) and from 90 to 92 fr. (36*s* 1*d* to 36*s* 10*d*) in 1910. The cows yield very little milk (4 or 5 litres a day (about 1 gallon) during an average of 7 months) but their milk is very rich. The average live weight of the Swiss-Lombard (Schwyz) cows is 5 quintals (9.8 cwt) with a comparatively small proportion of net weight (50 % on an average); these cows supply the largest proportion of the meat confiscated because affected by tuberculosis.

Simmenthal cows, when standing, weigh on an average from 6 to 7 qls (11.76 to 13.72 cwt), yielding a net weight when slaughtered of from 52 to 55 %; the average weight of Dutch cows, standing, is from 5 to 6 qls (9.8 to 11.76 cwt) with a net yield of from 48 to 52 %. Generally speaking, the cows are sold at sight. Ten years ago they were purchased at the rate of 40 to 45 and even 60 francs per quintal (16*s* 1*d*, 18*s* 1*d*, 24*s* 2*d* per cwt) of live weight, according to the state of nutrition they were in; but now they are paid for at the rate of 70,75 to even 90 francs per quintal (28*s* 2*d*, 30*s* 2*d*, 36*s* 2*d* per cwt).

872 KITTLAUSZ, K. **The Buffalo in Transylvania and the Balkan Countries.** — *Deutsche Landwirtschaftliche Presse*, 38. Jahrgang, Nr. 98 und 99. Berlin, 9. und 13. Dezember 1911.

Hungary

In Transylvania and the Balkan Countries, buffalo keeping is very widespread, and will for a long time to come play an important part. In other parts of Europe, also the buffalo could do very good service under certain condition.

The Transylvanian buffalo differs but little from its Indian congener; its ill-proportioned body, its coat, mostly slate grey to deep black in colour, which is almost bare in summer and in winter very thick, its shaggy legs, long thin neck and lean head with its malignant, beady eyes, make it very ugly in appearance. Notwithstanding this, it is a very good-tempered animal and quite harmless. Cases of viciousness are not more frequent than with other cattle. Dangerous tempered animals must be killed.

The phlegmatic nature of the buffalo, however, and its insensibility to punishment in an unexampled degree, render very skilful handling necessary if it is to be successfully made to work; then however it shows a great capacity for work, and at the same time its wants are less than those of any other domestic animal.

Its physical development proceeds slowly, and only terminates in the seventh year. The period of gestation of the cow is 11 months, and after calving, when on good grass lands, the cow's daily yield of milk is 6-7 kg. (10 to 12 pints); but the milk secretion does not last long, and a yearly milk yield of 1 000 kg. (220 gallons) is a very good one. The milk is exceedingly rich; it

contains twice as much lactose and fat as ordinary cow's milk; in exceptional cases the fatty contents may amount to 10 %.

This valuable property might be further developed by selection. In Transylvania buffalo milk is highly esteemed for use with coffee and for the preparation of cakes and biscuits. Buffalo milk could be sold to advantage in the vicinity of large towns and sanatoria, and it is intended to import buffalo cows into Germany as dairy animals. Buffalo meat is darker and coarser-fibred than beef, but is excellent as meat for soup.

Tuberculosis does not occur in the buffalo, but it is liable to foot-and-mouth disease, though to a much less extent than the ox. Strange to say, a few stings of the Kolumbacz fly (*Simulia columbaczensis* Fabr.) of the lower Danube valley may result in the death of the buffalo, while other cattle are not much affected by them

The weight of a full grown Buffalo ox is 550-650 kg. (10.78 to 12.74 cwt.); its price is about 300-400 fr. (£12 to £16) for cows, and 500-600 fr. (£20 to £24) are paid for bulls.

For field work and long journeys the buffalo is not suited, but it is well fitted for use where very heavy and steady draught work is in question, and could be advantageously employed in all cases where heavy loads are to be pulled on bad roads and soft soil. It could render particularly good service if kept in limited numbers on sugar beet farms and industrial farms. In Hungary it is often kept on farms of this kind

SHEEP.

CAMDEN **Lincoln-Romney Cross-Breeding in New Zealand.** — *The Pastoralists' Review*, Vol. XXI, No. 9, p. 1000. Melbourne, November 15, 1911. 878

New Zealan

English Leicester and down sheep are not very well adapted for the hilly grass-lands of New Zealand. A big, lively sheep with heavy fleece is wanted. These requirements are answered by the Lincoln. As at present, however, there is a greater demand for finer wool, the Lincoln are crossed with the Romneys; the latter are much sought after but only when of good quality.

The products of crossing the two breeds are only satisfactory if the parent animals do not differ too much in their wool. Experienced breeders therefore prefer to use Romney rams, the wool of which is not too fine, for their Lincoln flocks; this produces a well balanced offspring. Many breeders divide their breeding ewes into fine and coarse wooled, and put the former to Lincoln and the latter to Romney rams. All questions relating to Lincoln and Romney breeding are followed with keen interest in New Zealand It would seem that in the future, success will be a question of breeding sheep with the proper quality of wool.

PIGS.

874 HÖSCH, F. **Pork from Pasturage.** — *Der Weidebetrieb in der Schweine-Zucht.* Leipzig, 1906. — HARPENDING H. B. — *The Country Gentleman*, Vol. LXXVI, No. 3073, p. 21. Philadelphia, Dec. 23, 1911

Germany: United States

The view has recently been gaining ground that the cheapest and most healthy way of raising pigs is on pasture land. Hösch states that he fed 120 pigs (60 full grown and 30 growing sows, and 30 young animals) for 120 days on a clover field of 5 ha. (nearly 12 ½ acres), without any other food. If they had been fed in the sty, the average daily cost of feeding during the same time would have been 3*d.* per head making a total of £ 172 16*s.*

Mr. Harpending remarks on the value of pasture for breeding sows. All fodder crops can be used for pasturing, but Hösch considers red clover most satisfactory because the pigs can graze it several times during one summer, whereas annual plants, such as peas, vetches, spurrey, mustard, etc, can only be grazed over once.

Further, the damage done by grubbing does not matter so much in a one-year crop of red clover as in lucerne or grass. Harpending has had very good results with rye pasture; the rye should be drilled in, about two bushels to the acre, any time from Aug. 15th to Sept. 1st or later. It will furnish grazing from Oct. 15th right through the winter.

The pigs will get some feed from the rye; but better than that, it will induce abundant exercise.

About 1st April seed the rye pasture with six quarts of clover and one of alfalfa, the latter for inoculation against future sowing of alfalfa. The land should than be dragged with a spike-tooth harrow. After the rye begins to joint, the pigs should be turned into the clover, alfalfa, or blue grass, and not removed to the rye again, until the straw has broken a little. The change from the green food should be made gradually.

To prevent the pigs rooting the crop up too much, they should be ringed. This, however, is not recommended by Hösch. He considers that their habit of rooting up is due to an instinct; as they require for their growth the mineral substances they find in the earth. Ringing makes it impossible for them to get a sufficient amount of these. If they are driven four times a day to pasture: and only allowed there one hour each time, they have little time to spare for rooting up, and anything excessive in that direction may thus be avoided. In bad weather the pigs may be fed either entirely or partially on cut clover in the sheds.

In hot weather they should go to pasture in the morning and evening. To prevent over-heating they should not be driven too quickly; and good water is needful, before they go and when they return.

Summer drought makes it necessary to provide more pasture grounds than are required under ordinary circumstances.

Green food is more digestible while it is young; therefore pasturing should begin when the clover is about 4 3/4 inches high. By mowing the old clover, a constant succession of young clover is obtained.

An economic arrangement is to divide the whole field into a number of lots, and use a sheep-dog to keep the pigs to one enclosure at a time, as in the following plan:

I To be first grazed over.	II To be grazed over after Enclosure I.	III To be grazed over after Enclosure II
IV To be cut small, then grazed over.	V As IV.	VI To be cut later for food in bad weather.
VII To be made into hay, then grazed over.	VIII-IX If possible to be cut twice; then to be grazed over in the Autumn.	

Pigs less than 4-5 months old cannot be pastured, but they should be gradually prepared by giving them green food. Brood sows immediately after farrowing are also unfit for pasturing.

POULTRY.

875 **On Poultry-Farming in Europe.** AVANZI, E. (Per l'incremento della pollicultura in Italia. — *L'Agricoltura italiana*, Anno XXXVII, No. 709, pp. 673-684. Pisa, 30 Novembre, 1911. — DURIGEN. (Die Lage der Geflügel-Zucht im In-und Ausland). *Nachrichten aus dem Klub der Landwirte zu Berlin*, Nos. 556-557. Berlin, 13 November und 8 December, 1911.

Italy

Signor Avanzi begins by shewing poultry rearing to be one of the most important factors of national economy in Italy, and he bears out his statements by drawing up a table of the import and export values realised during the last ten years. From this it is seen that in 1911 the net exportation (*i. e.* the difference between exportation and importation) of living and already killed poultry amounted to 12 774 570 francs (£ 505 873); that of eggs to 30 237 400 francs (£ 1 197 401); and that of feathers to 8 280 085 francs (£ 327 891). During the last few years an increase has been noted in the importation of fowls and a diminution in that of the exportation of eggs, in consequence of the increase in the home consumption not being balanced by increased production. The author then takes a rapid survey of the estate of poultry-rearing in most of the countries of Europe.

France

In 1875, France was about the only country that supplied England with eggs, and the latter then imported from 30 and 35 millions francs worth (£ 1 200 000 to £ 1 400 000) per year. But now, on the contrary, the importation of eggs into France far exceeds the amount of exportation as will be seen from the following table.

	Importation		Exportation	
	kg	cwt	kg	cwt
1896	8 009 200	156 980	17 444 000	341 900
1910.	26 296 100	515 400	8 588 000	168 325

There is a training college for poultry rearing at Gambais.

Great Britain

Great Britain, which, in 1864, imported 2 000 000 francs (£80 000) worth of eggs, imported 200 000 000 francs (£ 8 000 000) worth in 1906. During the last few years, in spite of the increase in the consumption of eggs the import trade has been decreasing, owing to the growth and improvement of poultry rearing in England itself.

In 1898, the first college of poultry rearing was founded at Theale by the University College of Reading.

Cooperation has not become general; but an association of considerable importance, does nevertheless exist, called the « Cooperative Poultry Depot » (1).

Ireland

Ireland takes the lead among the countries that export poultry and eggs to Great Britain; and in 1909, exported 94 778 981 francs (£ 3 753 247) worth.

At the Newster School of Agriculture, Horticulture and Domestic Economy instruction is also given in the rearing of poultry.

Russia

Poultry farming has made rapid strides in Russia during recent years, largely owing to the active steps taken to promote it by the Imperial Poultry Rearing Society (2).

The Russian exportation of the products of poultry-rearing is considerably larger than that of other European countries. In 1910 it was stimated at 216 million francs (£ 8 640 000). This is easily explained when the extent of the empire is taken into consideration, as well as the fact that the comparatively large tracts of land under cultivation facilitate the rearing and feeding of poultry at small cost.

Russian poultry-farming includes great varieties of breed. The native hen, without uniformity of type, the native duck and goose are to be found all over the country Together with these there are improved breeds: the Pawlovsky and the Orloff hens are specimens of Russian breeds, only, however, reared by amateurs. For commercial purposes the Orpington, Wyandotte, Langshan and Plymouth Rock are chiefly used; the last named are specially plentiful in the Government of Moscow. The Rouen type predominate over all the foreign breeds of duck. As regards geese, Russia has several breeds of great value from an economic stand point. The best species are reared in the regions south of St. Petersburg, in the Governments of Pskow and Novgorod as well as on the banks of the Volga. In connection with the latter must be mentioned the geese of Arsamas and Tula, excellent for fattening, and the famous Chomolgory breed, the flesh of which is however quite second-rate in quality. In the Volga territory, as well as in the west of the empire there are large establishments for fattening geese which are bought thin and fed for two or three weeks on oats; then they are exported ready for food. In the Governments of Tambow and Woronesch the geese are frozen when killed and kept till the following spring to be exported when market supplies are falling off. Fowls are treated in the same manner, the town of Kursk, the central market of southern Russia, supplying them alive, in large quantities.

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(1) See *B.* Aug.-Sept.-Oct. 1911, No. 2828. (*Ed.*).

(2) See *B.* Aug.-Sept.-Oct. 1911, No. 2827.

In the Government of Yaroslaw there is a company for the rearing and fattening of fowls. Fattening establishments like those in France have also been founded with an attempt to improve on them. The fowls are fed on flour (especially barley meal) and milk ; and experiments prove that goat's milk produces the best meat.

Since the construction of railways in central Russia, the exportation of eggs has become even more extensive than that of poultry ; in 1910 2998 million eggs were exported.

The Russian Government is trying to encourage poultry farming by granting travelling scholarships on condition that the holders of them shall organise special courses of instruction as soon as they return to Russia.

As a consequence of the comparatively low price of her eggs, Russia is gradually gaining the ascendency on all the foreign markets; in proof of which it suffices to quote the English market :

	Importation of eggs into England		
Exporting countries	Value in francs	in £	Percentage
Russia	82 777 000	3 277 970	50.25
Denmark.	43 683 740	1 729 876	19.90
Austria-Hungary. . .	14 022 270	555 282	7.47
France.	10 530 483	417 007	4.96
Italy.	8 833 000	349 787	4.07
Germany.	5 065 690	200 601	2.77
Canada	27 666	1 095	0.01

Germany

In 1899 the German Ministry of Agriculture gave a grant of 49 706 marks (£ 2485 6*s*) to promote poultry-farming; this sum was gradually increased till it reached 173 817 marks (£ 8690.17*s*) in 1906, at which figure it has since remained. In Prussia and other States of the German Federation, experimental schools have been founded, having a twofold aim: *viz.* poultry-rearing and training for the same. Small breeding centres have also been formed, known as « Zuchtstationen » and « Muster-Geflügel-Höfe » under the management of the most active among the agriculturists. About 3000 of these « Zuchtstationen » exist in Germany; 2300 of which are given up to poultry-farming : and of the latter 1200 make it their exclusive business to rear fowls of Italian breed.

Belgium

In Belgium, where property is very much subdivided, most of the farms measuring less than 10 ha. (24.7 acres), poultry-rearing has increased in a remarkable degree; owing no doubt to the united efforts of the members of the « National Federation of the Poultry-rearing Societies of Belgium », the number of whose branches rose from 29 to 131 and that of its members from 2107 to 6630, between 1898 and 1909. The Government gives an annual grant of 12 000 francs (£ 480) to this Association; in addition to which it provides for elementary courses of instruction in poultry farming. Belgium has made a speciality of rearing fowls for the table as well as exporting them fattened.

Holland

In Holland, too, small farms predominate, few of them measuring more, and oftener less, than 100 ha. (247 acres); so that poultry-farming has been similarly taken up there. The « Dutch Association for the Rearing of Poultry and Rabbits » whose headquarters are at the Hagne, was started eight years ago; it now numbers 15 000 members, with 233 branch associations. During the last 4 years it has formed 4 cooperative societies, with 8000 members, for the sale of eggs and poultry. But this industry is chiefly carried on privately.

With regard to the spread of poultry-farming in Denmark, the number of fowls reared there increased from 4 $^1/_2$ to 11 $^3/_4$ millions between 1888 and 1909, so that there are now 439 fowis to every 100 inhabitants; the chief breeds being the native, the Italian and the Minorca. Special attention is given to the production of choice eggs for exportation. This is carried on by rural associations comprising 500 districts with 40 000 members. These societies have served as a model for the formation of similar societies in North Germany and Ireland.

Denmarl

Poultry-rearing in Denmark is carried on under careful Government supervision ; three officials (Konsulenten für Geflügelzucht) having been specially appointed to give instruction in poultry-rearing in the rural districts.

Signor Avanzi recognizes the fact that in Italy the industry is carried on exclusively by small farmers with an utter absence of any scientific basis or system of rearing, and without any attempt at organisation in the sale of produce.

He points out the strong points in the Italian varieties, an intelligent selection of which would permit of obtaining breeds specially fitted for laying eggs during the autumn and winter.

There is a wide difference between the limits of average profit in the rearing of chickens.

A certain form at Massa Lombarda in the province of Ravenna, yielded (on a three year's average) a net annual income of 2.98 francs (2*s* 4.3*d*) per hen with a production of 75 eggs, and the cost of food was 2.64 frcs. (2*s.* 2*d.*) Sérée calculates the annual profit on 200 hens to be 4.88 francs (3*s* 10.4*d*) per head; Trevisani fixes it at 3.76 francs (2*s* 11.7*d*). Théodore Pascal estimates at 16 %, and even as much as 32 %, the revenue of capital invested in poultry-farming near Rome. In a competition lately held in Australia to determine the average profit on selected poultry, it was proved that the cost of feeding varied between 3.25 and 6.65 francs (2*s* 6.8*d* and 5*s* 4.2*d*) and the profit between 7.90 and 16.55 francs (6*s* 3*d* and 13*s* 1*d*) per head. The average annual production of these breeds was 175 eggs, whilst that of the prize hens varied between 222 and 255, sometimes even reaching 270 and 280.

The « Ancona » (1), « Leghorn », and « Valdarno », are excellent breeds, the first two on account of their eggs and the latter for the table; they are of Italian origin, but have been selected and brought to perfection in foreign countries. They show how much might be done, and to what advantage, for the improvement of poultry farming in Italy.

876 LANORVILLE, G. **French Turkeys for the English Christmas.** — *La Vie à la Campagne*, Vol. X, No. 126, pp. 340-341. Paris, 15 Décembre 1911.

France

The turkeys sold every December in the English markets are sent for the most part from France Gers, Lot-et-Garonne, Sologne and Normandy are the breeding centres for these birds. From the market of Laigle (Normandy) alone, from 8 000 to 10 000 turkeys reared in the neighbourhood are sent to England every year between the 13th and 20th of December.

The price of purchase per kilo is, on average fr. 1.80 (9*d* per lb) for turkeys weighing from 6 ½ to 9 kilos (13 to 18 lb), 2 francs (10*d* per lb) for those weighing from 9 to 10 kilos (18 to

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(1) See *B.* Aug.-Sept.-Oct., No 2830 (*Ed.*).

20 lb), and fr. 2.40 (11*d* per lb) for those of 11 kilos (20 to 22 lb) and above. Neither turkey-cocks nor turkey-hens under 6 ½ kilos (13 lb) are much in demand. The birds must be delivered unfed in order to prevent internal fermentation before they are sold for consumption.

As soon as weighed the turkeys are hung up by the feet and killed by raising the head with a jerk and bringing down the other hand or knee with great force upon the neck so as to break the spine. At the same time two workers pluck off all but three large wing feathers, the whole process requiring no more than a few minutes to each bird. The feathers are put aside to be sold also.

The agents of the English dealer who purchases these turkeys, use strong pressure of the hand on the crop and breast of the animals to expel the air and prevent possible fermentation. After this the birds are put into a cooling chamber. The best way is to place them on a shelf, breast downwards with the croup in the air and the head and neck hanging outwards. The day after being killed the turkeys are packed, from 9 to 18 in one case, the bottom of which is covered with a layer of straw and the sides lined with white paper Both the bottom and the lid of these cases are furnished with wide openings to allow of the free passage of air. Care is taken to pack only birds of one class, *i.e.* of equal weight in the same case. These cases are then sent to Caen. Two days after despatcht, the turkeys arrive in London, where they are sold by auction or consigned to dealers who unpack, clean and prepare them to be re-sold

STENZEL, P. **The Practical Use of the Poultry Cart.** (Die praktische Verwendung des Geflügelwagens). — *Deutsche Landwirtschaftliche Presse*, 38 Jahrgang, No. 99, pp. 1131-1133. Berlin, 13 Dezember 1911. **877**

Germany

The managers of the farm of Klein-Wanzleben near Magdeburg keep about 1 000 young fowls, mostly Italians and Wyandottes, on their extensive sugar beet fields during the summer, with a view to destroying beet pests of every description. The necessary chicks are hatched in an artificial incubator and kept for 6 weeks in chicken houses, after which they are placed for 2 or 3 weeks in well aired sheds and are thus sufficiently hardened. This having been done, the young birds are conveyed to the beet fields in two-wheeled trucks or four-wheeled carts. The carts are lined up at considerable distances apart and serve as poultry houses from that time onwards; they are specially designed for that purpose, being equipped with doors, windows and ventilation; they look something like small railway carriages. A watchman with a dog remains with the poultry on the field, day and night, in a cart fitted up as a living room, to prevent thefts. After a few days the carts are moved on; this is necessary, because the fowls must obtain the whole of their food on the beet fields and receive no additional rations. Only water is provided, in suitable drinking troughs. A water cart is at hand to bring up the water. After the grain harvest, the fowls are put into the stubble field and feed on the scattered grain.

This method of poultry keeping is very satisfactory, the beet pests are destroyed and a handsome profit is secured. For the operation a capital of about fr. 6 200 (£245) is needed; for incubators, houses for the chickens and young fowl fr. 1 250 (£49.19s), for fowl carts fr. 3 700 (£146.10s) and as working capital fr. 1 250 (£49.10s).

Breeding 1 000 chicks, the cost of each of them, together with food until driven out to the fields, is fr. 0 75 (7.12*d*). On the field there are no further feeding expenses. The selling prices in the autumn are, for poultry to be slaughtered, fr. 1.50 per kilogramme (6.45*d* per lb.) and for breeding poultry fr. 2 (8.6*d*) The animals attain to a weight of 2 to 2 ½ kg. (4.4 to 5.5 lb.) and each fetches about fr. 3.75 (2*s* 11.6*d*).

The following are the particulars of the calculation :

Receipts :

For 1 000 hens at frs. 3 75 (2*s* 11.6*d*) . . . . . . frs. 3 750 (£148.10*s*)

Expenditure :

Costs of production for 1 000 chicks . .	fr.	750 (£29.14*s*)	
Watchman's wages	,,	500 £19 16*s*)	
Use of team.	,,	250 (£ 9.19*s*)	
Losses, about	,,	220 (£ 8.14s)	
Interest and redemption about.	,,	800 (£31 13*s*)	
Total . . .			fr. 2 520 (£99.16*s*)
Profit			fr. 1 230 (£48.14*s*)

Poultry in New Zealand. — *The Journal of the New Zealand Department of Agriculture,* Vol. 3, No. 5, p. 431. Wellington, 15 Nov. 1911. **878**

New Zealan

The number of poultry kept in New Zealand has increased by more than half a million during the last five years, as the following figures show :

Description	Number 1906	Number 1911
Geese	44 300	45 311
Ducks	281 999	329 163
Fowls	2 784 269	3 214 045
Turkeys	77 101	97 884
Other fowl . . .	3 935	5 554
Total . .	3 191 604	3 691 957

Italian Bees. — *Agric. Economist and Horticultural Review,* Volume XLIV, No. 504 (New Series), p. 327-328. Dec. 1911. **879**

Italy: Great Britai

For profits, if extracted honey be the object of the bee-keeper, no other race can excel the Italian. In some cases, a first cross between the common English bee and the Italian produces an excellent bee which often beats the black bee.

Where Italians have been bred for hardiness, honey-gathering and fertility of the queen, and not for fancy points, such as light colouring of the yellow bands, they are not subjet to winter dwindling to such a degree as is very often imagined.

There is often a difficulty in keeping the race pure, when one is surrounded by black bees, so pure Italian queens must be imported, for when hybrids have only a slight trace (which is generally marked by one yellow band of the Italian strain, we have a class of bee, which, when smoke is applied, falls off the combs without attempting to gorge itself with honey, causing the greatest possible commotion in the apiary.

The pure strain can often be manipulated by a careful apiarist without using the smoker, and it is excellent for ridding the hive of the wax moth.

The pure Italian queen, drone, or worker may vary much in its markings, but there are always 3 yellow bands distintly visible on the abdomen.

880 WEIPPL, T. H. **An excellent Nectar Plant.** (Eine ausgezeichnete Honigpflanze). — *Illustrierte Monatsblätter für Bienenzucht.* XI. Jahrgang, Nr. 12, pp. 140-141. Klosterneuburg, 1. Dezember 1911.

Austria

The golden rod (*Solidago aspera*) (1) in Lower Austria is found to be an exceedingly good nectar plant. The plant is one of the Compositae; it attains a height of 4 ½ to 6 ft. and is upright, with willow-like foliage. It flowers from July to October. The flowers are golden-yellow and form panicles; they appear to produce the nectar chiefly in the afternoon.

Solidago aspera specially grows in the neighbourhood of rivers and other waters. On the Danube meadows above Vienna it frequently occurs; below Vienna it is rarer. On suitable soil the plant grows like a weed; owing to its beautiful blossoms it is suited to be an ornamental plant for gardens.

SILKWORMS.

881 **The Laboratory of the Co-operative Society for the Seasoning of Silk, and Studies and Experiments on Silk, at the Turin Exhibition.** (Il laboratorio della Cooperativa per la stagionatura delle sete ed i suoi studi ed esperienze sulla seta, all'Esposizione di Torino). — *L'industria serica.* Torino, 11 Dicembre 1911.

Italy

This Laboratory, founded a little more than 15 years ago, has during this period carried out a number of experimental enquiries in the most varied departments, and it has obtained practical results of such importance that it may be said to have well fulfilled the programme mapped out by its founders, that is to say, it has become a centre of useful initiative for the technical progress of national sericulture.

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(1) Synonym: *S. rugosa.* Country of origin: North America. (Cf. *Index Kewensis*). (*Ed.*).

In accordance with the wishes expressed by a Special Commission of the Silk Association, it went into the question of the deleterious influence exerted on silk by sulphur or formalin fumigation when carried out during the breeding of the worm; it has precisely defined the conditions which cocoon drying rooms must comply with, and it has indicated the many types to which preference should be given. It has once more demonstrated the superiority of the Italian strains, and has crossed Chinese strains with Japanese. It has invented new appliances for conditioning small samples of silk and for ascertaining defects of manufacture in the fabrics; and it has created a water analysis department for the improvement of the water not naturally adapted to manufacture. It has given very special consideration to the defect of scaling of the silk, and has shown that if specified rules are applied for the steeping of the silk, it retains its natural structure and brilliancy.

The Laboratory has likewise directed its investigations to the question of dyed silks; in numerous publications it has summed up the phenomena which result in the rapid alteration of impregnated silks, and has pointed out some new reagents which result in an increase of the life of the fabric.

In an important work it recently published, it set out the results of its enquiries into the commercial, physical and chemical properties of some of the principal varieties of cocoons and the thread obtained from them, in order to establish the purity of the silks of a given origin as well as their characteristics according to the strains of worms from which they are obtained. It took the initiative in the application of the means recently contrived for mitigating the drawbacks arising from the excessive humidity in spinning works, and it indicated the measures to be taken for the improvement of the conditions of health of the operators.

The Laboratory also concerned itself with the means of detecting frauds in the silk trade. Quite specially interesting and highly instructive were the observations it carried out as to the vitality of the chrysalides of the silk worm and the preservation of cocoons in cold storage chambers.

DUCOUSSO, G. (Attaché to the Consulate of France at Beirût). **Syrian Silks.** (Les soies de Syrie). *Bulletin des Soies et des Soieries.* No. 1805, pp. 5-6. Lyon, 9 Dec. 1911. **882**

In Syria spinning mills on the archaic system known as the "Arab spinning wheel", with extremely primitive plant, are falling off in numbers year by year.

Ottoman Empire: Syria

The cocoons spun in Syria on the Arabian reel are of two descriptions. One consists of third-rate products ; and the second is made up of bad spotted cocoons, which the silk-worm breeders themselves make haste to get rid of.

Arabian silk, after sorting out, furnishes five different qualities of thread, namely : very fine, fine, medium, coarse and very coarse. The Beirût market receives an annual average of 10 000 to 11 000 " okes " (1) of this silk.

Exports of this silk to Egypt were formerly much more considerable.

The silk known as " Skandarani " is for the most part spun according to the European method. The quantity varies very much according as the European market is better or worse. The production of this silk is estimated at 3500 to 4000 " okes ". " Douppion " silk is the product of double cocoons put aside at the time of purchase and spun afterwards. Beirût is the great market for it. The quantity sold there every year is estimated at from 10 000 to 12 000 " okes "

With regard to the quantity of silk spun on the Arabian reel, it may be estimated at a total of 100 000 okes, two thirds of which are used within the country.

There was a time when Skandarani and Douppion silks were compelled to face the competition of importations from Tiflis, Adrianople and Persia, but for the last twenty years these silks have almost completely ceased feeding the Syrian market, which obtains its supplies exclusively from Brussa as regards Douppions, and from China for the silks known as Shantung, Vincho, Sichong and Chini, and Indian " Skin " silk.

FISH.

888 SCHEIDLIN-USTRON, C. **Introducing Water containing Air into Fish Ponds and Fish Tanks.** (Zuführung lufthaltigen Wassers in Fischteiche u. Behälter). *Illustrierte Landw. Zeitung*, 31 Jahrgang, Nr. 97, pp. 899-900. Berlin, 6 Dezember 1911.

Germany

The best method of introducing water containing air into fish tanks and ponds is by the following simple device : A bent pipe, A, is fitted so as to open out into the pond or tank water, while its upper end projects into a superelevated basin. The flow of water into this basin must suffice to replace the outflow through the pipe A. Inside the pipe A, a smaller pipe B is mounted, so that its lower end is immersed in the down-flowing water; by this means air is drawn in through the pipe B and mingles with the water running out through pipe A, thus passing into and aerating the water in which the fish live.

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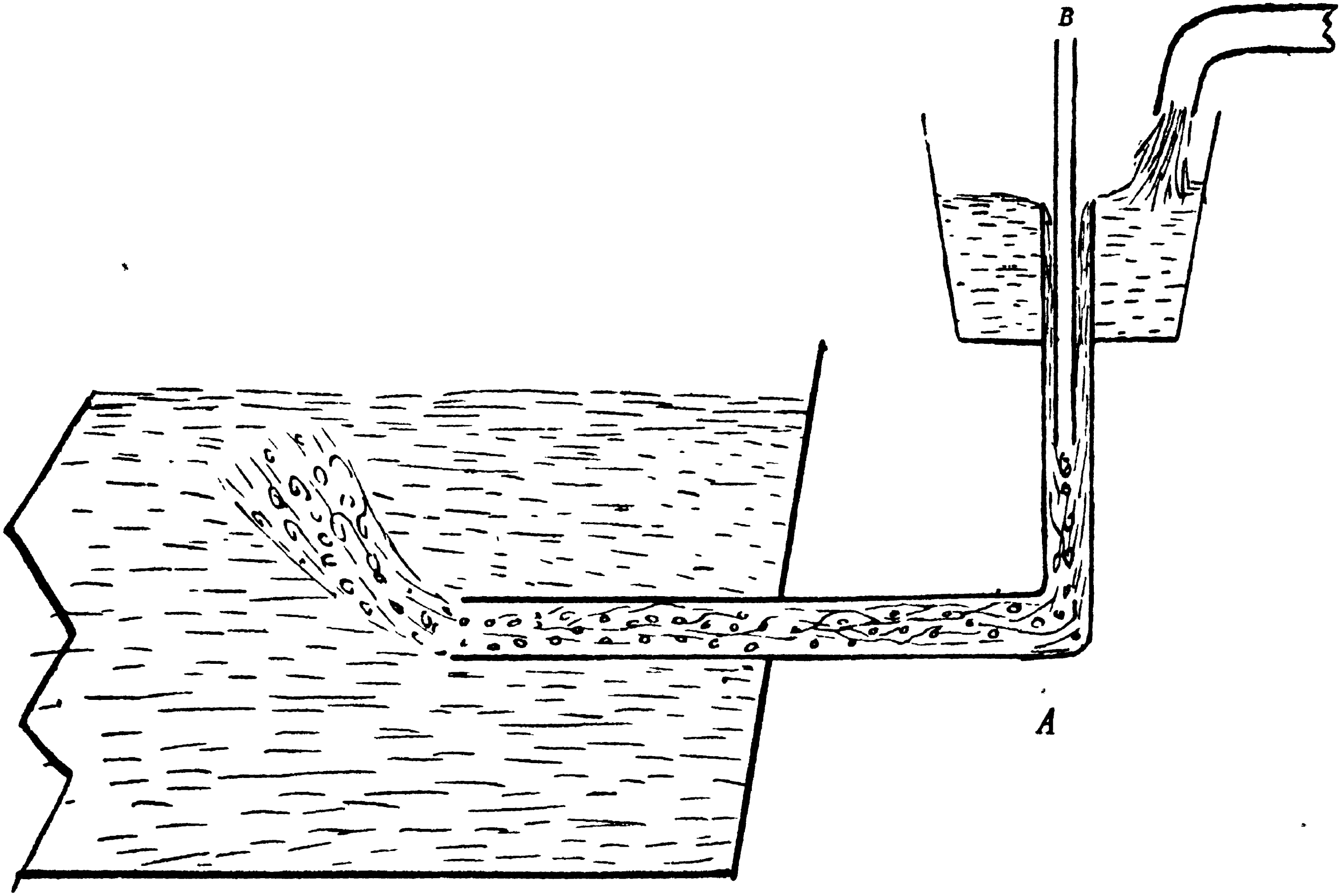
(1) An « oke », the Turkish unit of weight, is equivalent to 2.8326 lb. avoirdupois (*Ed.*).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A

HEIN, W. **Effects of Abrupt Changes in Temperature on the Eggs and Fry of the River Trout.** (Ueber die Wirkungen plötzlicher Temperaturschwankungen auf die Eier u. Brut von Bachforellen). — *Allgemeine Fischerei-Zeitung*, 36 Jahrg., Nr. 23, pp. 505-510. München, 1 Dezember 1911. **884**

Germany

In a series of experiments Dr. Hein had found that the eggs of the River Trout are not easily altered by mechanical influences except in the last phases of incubation, when their resistance is at its lowest. This fact, however, does not sufficiently explain the causes of the losses of eggs and fry which sometimes occur and which are not brought about by the above mentioned causes, because generally the conveyance of fertilised eggs does not take place at that critical period.

During the winter of 1908 to 1909, the Author therefore undertook investigations into the influence of changes of temperature of the water. At the different stages of incubation, eggs, and after hatching, fry, were put into water at a temperature much higher or much lower than that of the incubator.

In the first series of tests 100 eggs (or fry) were put each time into water at 25° C., the aeration of which was carefully attended to. After remaining under the influence of this temperature for one hour, the test specimens were replaced in the incubation trough, the water of which was constantly at 8.9° C.

The eggs (or fry) of the other series, after staying for one hour in water at 25° C., were again put for an hour into water at 0.2-0.5 C.; after these operations, the incubation in water at 8.9° was continued. The transfer of the test specimens was carried out abruptly, which would tend to aggravate the effects of the differences of temperature.

In order to check and complete the results of these tests, the Author resumed them during the winter of 1909-1910, and furthermore carried out a third series, in which he passed the eggs and fry direct from the incubator into water at 0.2-0.5° C. and not into water at a high temperature. The results are comprised in the following table.

Test No.	Temperature of the water	Year	Time in hours	Number of test specimens	Losses from the 5th to the 107th day (1).	
					Eggs	Fry
I	25° C	1908	1	1 300	179	301
II	25° C 0.2 — 0.5° C	1908	1	1 300	255	366
III	25° C	1909	1	4 800	370	1 102
IV	25° C 0.2 — 0.5° C	1909	1	4 800	609	1 209
V	0 2 — 0 5° C	1909	1	4 800	159	133

The losses brought about by the changes of temperature were not the same in the different phases of the test. Generally speaking, the eggs proved most sensitive to changes of temperature 14 days after fertilisation, while the fry showed their lowest resistance about the 10th day after hatching. The losses sunstained were then from 95 to 100 %, while at the other times they did not exceed 36 %.

The growth of the surviving fry was kept under observation : it was perfectly normal.

From these experiments it follows that the eggs and fry of the River Trout, except during a term of 14 days after fertilisation and 10 days after hatching, can withstand considerable changes of temperature; their death must therefore be due to other causes still to be discovered.

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(1) In 1909 the losses were only counted up to 100 days.

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS.

DE CONDÉ, F. **The Arion Traction-Engine.** (Le Tracteur Arion). — *Journal d'Agriculture pratique*, 76e année, T. I, No. 1, pp. 19-20. Paris, 4 Janvier 1912. 885

France

This apparatus is based on the principle of hauling employed in rivers for tugs. It was first experimented in 1910 by M. Louis Petit, a farmer in Champagne and has now been in regular work since last October during the autumn ploughing.

To this four-wheeled traction engine is affixed, on one side, a system of grooved pulleys worked by a 30 horse power, 4 cylinder internal combustion engine; a steel cable fixed to the two ends of the field passes round the pulleys, and when these are set going, the engine moves, hauling itself along by the cable; the wheels are not driving wheels and merely bear the traction-engine which weighs 1 400 kg. (27 ½ cwt.).

To this is attached, sideways, a reversible balance plough; at the end of the furrow, the plough is reversed by tilting and the traction-engine returns, tracing another furrow; the guiding wheels are now in the front, now at the back of the engine.

The anchors to which the two ends of the cable are fixed are composed of two little trucks mounted on four wheels, two of which are furnished with iron disks that penetrate into the ground.

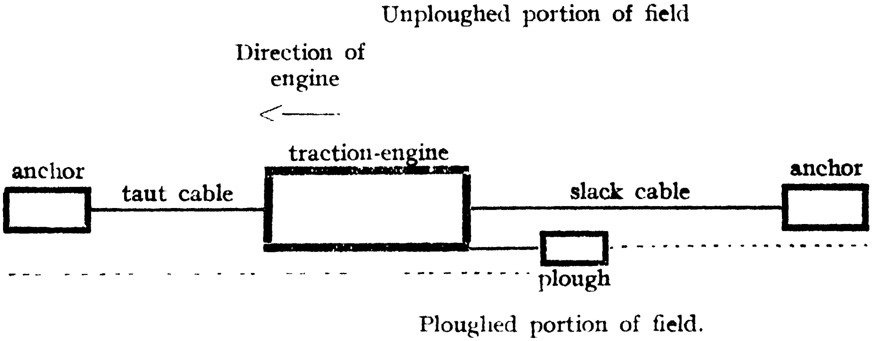
They are moved along the headland at each end of the furrow at a distance equivalent to the breadth of the furrow.

Two men are needed for the work: an engineer to work the motor, and an assistent to tilt the plongh and move the anchors.

With a strong reversible Brabant balance plough with open work mould boards, the speed of this apparatus, in the fields of Champagne is 6 km. (3.7 miles) an hour for ploughing at a depth of 26 cm. (10 inches) and a width of 34 cm. (13 ¼ in.).

The accompanying diagram shows the apparatus at work; the taut cable in front of the traction engine and the slack end hanging behind, the plough and the two anchor trucks at the two extremities of the field.

THE ARION TRACTION-ENGINE AT WORK.



386 RIETHOF G. **Belt Drive in Practice.** (Praxis des Riemenantriebs). — *Landwirtschaftliche Maschinen und Geräte.* 11. Jahrgang. No. 25, pp. 13-15. Artern, 16 Dez. 1911.

Germany

The resistance to tearing of belt leather varies according to its quality, from 2.5-6 kg. per square mm. (3 556 to 8 532 lb. per sq. inch.), that is to say that each square millimetre of belt section can be loaded with this weight before it tears. In actual operation, however, the load may only amount to a small portion of the value indicated and the load of 0.10 to 0.30 kg. per square mm. (142 to 426 lb. per sq. inch.) section has been empirically determined as the most suitable. How far it is permissible to go in an individual case depends on the speed of the belt and the quality of the leather. A slow running belt (up to 10 m. (32.5 ft.) speed per second) should not be loaded beyond 0.12 kg. per sq. mm. or 12 kg. per sq. cm. (170 lb. per sq. in.); the same belt however at 25 m. (81.25 ft.) speed will without injury bear a load of 0.20 to 0.25 kg. (284 to 355 lb. per sq. in.) per sq. mm. section, *i. e.* nearly double. Oak-tanned belt leather possesses a resistance to tearing of 4.5 kg. (6 399 lb. per sq. in.), and good chrome leather 6 kg. per sq. mm. section (8 532 lb. per sq. in.), while belt leather prepared on the quick tanning method exhibits a resistance to tearing of 3 kg. per sq. mm. (4 266 lb. per sq. in.) only. Generally speaking, the working strain should be only one twentieh of the tearing strain, *i. e.* the belt should only be loaded up to 1/20th of the tension at which it would tear; other conditions being equal, it will then retain its elasticity longest.

The amount of load is best ascertained from the stretch; the latter may, on good and not overloaded belts, not exceed 2 % in normal conditions. The extent of stretch does not allow of a direct conclusion as to the quality of the leather; drum tanned belt leather may show a smaller stretch and greater resistance to tearing than oak-tanned leather, and yet the latter is much more durable, because it remains elastic longer. Frequent greasing is essential for the retention of elasticity. The conjunctive tissue fibres of which leather chiefly consists, undergo mutual friction during the work of the belt and are consequently injured in the course of time. By greasing, this internal friction is reduced because the fibres are coated with grease. Suitable lubricants are tallow and boiled fish oil; they are applied on the grain side, previously cleaned, of the belt, but not in excessive quantities, because over-greasing causes the belts to slip. The use of resinous adhesive grease or of resin should be avoided under all circumstances. It is true that for a short time it gives a good grip, but the belts speedily lose their elasticity and are ruined. Every leather belt possesses sufficient natural adhesion; slipping is only a sign of insufficient pulley contact surface or other faults of design. The greatest possible surface of contact of the pulley with the belt is secured if the lower half of the belt is allowed to work and the upper half to sag.

It is often asserted that the ratio of the diameters of pulleys to each other should not be greater than as 1:5, but if the distance of the shafts is large enough and the belt wide enough, it will continue to work well under far more unfavourable conditions. In cases of emergency a tension pulley may also be used, but this nevertheless does not allow of transmitting a given force by too small a section of belt.

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RINGELMANN. **Raising Liquid Manure.** — *Journal d'Agriculture pratique*, 75e Année, Nos. 47, 48, 50, 51, pp. 654-656, 686-690, 752-754, 783-786; 76e Année, No. 1, pp. 23-26. Paris, 23 et 30 Novembre, 14 et 21 Décembre 1911, 4 Janvier 1912.

France

The author describes the principal appliances used on farms for raising liquid manure.

With the *pole or rope pail* the height of lift must be limited to 3 metres (9 ft. 9 in.), and, in practice, a man can raise the following quantities per hour:

To 1	metre height	(3f . 3in.)	3300	litres	726	gals
» 2	» »	(6ft. 6in.)	2900	»	638	»
» 3	» »	(9ft. 9in.)	2600	»	57[illegible]	»

The *tipping pail*, frequently used in France, is capable of a mechanical efficiency of 59 and 60 %. It can be used for lifts not exceeding 4 metres (13 ft.) in height. The following outputs may be reckoned per hour:

3400	litres	748	gals	lifted to	2	metres	(6ft. 6in.)
2700	»	594	»	»	3	»	(9ft. 9in.)
2050	»	451	»	»	4	»	(13ft.).

With a view to facilitate the work while increasing the capacity of the appliance, the author proposes the use of a pail having in its bottom a hole closing by means of a semi-spherical flap valve. The valve has a prolongation in the form of a rod passing through the opening and ending in a ball, the diameter of which is greater than the bottom opening of the pail. When the pail is lowered into the cistern, the ball strikes against an obstacle fitted at a suitable height, and the valve is lifted; the liquid then enters the bucket through the lower part. When the bucket, drawn up by the rope to the end of which it is fastened, reaches the upper part of its path, it is only needful to lower it a certain amount in order that the ball, once more striking against a suitably placed stop, should lift the valve and secure the emptying of the receptacle, which thus need not be tipped or touched directly by hand.

In the *chain pump*, the tube used for lifting the liquid is generally made of cast iron. It consists of one or more parts.

In order to get a good yield of work from the machine, attention must be paid to the following points:

1. The inside of the rise pipe must be throughout of uniform section (the tubes must be joined by outside clips or flanges).
2. The chain plugs must not cause friction against the inside of the rise pipe.

The simplest lenticular plugs are made of cast iron like the pump pipe. Their pitch or distance apart should be equal to the length by which the pipe is immersed in the liquid, or preferably slightly smaller than this amount.

The diameter of the rise pipe must be smaller in proportion as the lift is greater, so that the load on the chain should not exceed 9 or 10 kilogrammes (20 to 22 lb.) for hand pumps and a maximum of 50 kg. (110 lb.) for motor driven pumps. It is desirable not to exceed the following figures:

Height of lift			Diameter of pipe			
			Hand pump		Motor pump	
met.	ft.	inches	met.	inches	met.	inches
2.50	8	1.5	0.070	2.75	0.160	6.3
3.00	9	9	0.065	2.56	0.145	5.71
5.00	16	3	0.050	1.97	0.113	4.45
7.00	22	9	0.040	1.57	0.095	3.74

With a good chain pump a man can, in practice, lift 3 cubic metres (105.94 cub. ft.) of liquid manure per hour to a height of 5 metres (16 ft. 3 in.).

Among *forcing pumps*, the author mentions and describes the rough wooden pumps still used on a certain number of small farms, and the Fauler iron pump which has come into use in France since 1882. Trials carried out at Clermont-Ferrand with the latter, operated by a man, gave the following results:

Height of lift	m. 2.40 (7 ft. 10 in.)
Time	4 minutes
Output during test	140 litres (30.8 gals)
Output of pump, per minute, to height of 1 metre (3 ft. 3 in.)	108 litre (23.7 gals)

At the Machinery Testing Station in Paris, on a Fauler pump of the following dimensions:

Diameter of piston	m. 0.058 (2.28 in.)
of suction and delivery valves	m. 0.055 (2.16 in.)
Diameter of delivery pipes . .	m. 0.060 (2.36 in.)

the following average outputs were obtained per piston stroke, varying with the length of stroke, for different heads or heights of lift:

Height of elevation		Average piston stroke		Volume of water raised practically per piston stroke	
metres	ft.	metres	inches	litres	pints
1.84	6.03	0.76	29.92	1.75	3.08
2.35	7.70	0.82	32.28	1.72	3.03
4.35	14.26	0.81	31.89	1.33	2.34
6.35	20.10	0.79	31.10	0.98	1.72
8.35	27.47	0.76	29.92	0.65	1.14

The mechanical efficiency of the pump diminishes with the height of lift; the same is the case with regard to the yield, that is to say, the ratio between the volume supplied in practice and the calculated volume. This reduction is due to the piston not being water-tight. This is one of the features of the machine, the low price of which allows of its being put to many uses on the farms for lifting-heights not in excess of 4 metres (13 ft.). Leakage may be reduced, however, by putting a hay or straw plug beneath the piston.

With *suction pumps*, the liquid manure cannot be raised above 7 to 8 metres (22 ft. 10 in. to 26 ft.), owing to the escape of the gas it contains, and especially to leakage through the piston and valve packing which it is impossible to make absolutely tight.

Among the many patterns of suction pumps, the author refers to what is known as Douglas's *basin* pump, in which the vertical plane of oscillation of the lever can be placed in any position in relation to the discharge spout. The following is a recapitulation of the observations made with a pump of this kind when it had been in operation for several years in the National School of Agriculture at Grignon:

Piston diameter	m. 0.076	3	inches
» maximum stroke	» 0.090	3.54	»
Height of lift	» 3.30	10 ft. 10	»
Calculated volume generated per piston stroke	litres 0.408	0.72 pints	
Yield	» 91.9 %		

The author gives a description of portable suction pumps, particularly those mounted on a tripod, and those resting on the bottom of the cistern by means of an expanded cast iron base fitted to the lower part of the suction pipe; the base is provided with 4 holes through which the liquid passes.

In *suction and forcing pumps*, spherical valves lined with rubber must be preferred to hinge-mounted flap valves. These valves should be very easy to inspect because they are likely to get frequently choked up in the course of work. The suction pipe should be provided with an inside spiral made of iron wire, so that it does not flatten from the effect of a sudden drop in pressure during suction.

Suction and force pumps are either single or double action. The latter are more efficient. In the former, the losses can be reduced, and consequently the efficiency increased, by connecting two pumps on the same pipe.

In trials carried out at Clermont Ferrand with double action pumps the following results were obtained:

	Pumps worked by 1 man.						Pumps worked by 2 men.			
Diameter of cylinder	m 0.120	4.72 in.	m. 0.138	5.43 in.	m. 0.150	5.90 in.	m. 0.140	5,51 in.	m. 0.170	6.69 in.
Piston stroke . . .	» 0.135	5.31 »	» 0.150	5.90 »	» 0.200	7.87 »	» 0.120	4.72 »	» 0.180	7.09 »
Total height of lift .	» 2.20	7ft. 2.6 »	» 2.20	7ft 2.6 »	» 2.20	7ft. 2.6 »	» 2.30	7ft, 6.5 »	» 2.20	7ft. 2.6 »
Time required (minutes, seconds). . .	5' 00''		6' 45''		3' 15''		' 30''			
Litres lifted during the test.	220	48.4 gals	440	96.8 gals	360	79.2 gals.	440	96.8 gals	1000	220 gals
Output of pump in litres lifted to 1 metre height. .	96.8	21.3 »	143.3	31.52 »	242.0	53.37 »	289.1	63.6 »	381.4	83.91 »

One man can practically raise 150 to 200 litres (33 gals to 44 gals) according to the condition of the machine, to 1 metre (3 ft. 3 in.) height per minute. If the output drops below 150 litres (33 gals) the pump is too small in size, or the machine is either bad or in bad condition.

Suction and forcing pumps may, on a farm, be put to many uses. They are a valuable auxiliary in the event of fire.

To prevent coarse fragments making their way into the lifting machinery, the inlet must be protected by a strainer formed by a widely plaited wickerwork basket with spaces of 2 to 3 cm. (0.78 to 1.17 in.).

Before lifting the liquid manure from a cistern, it is always desirable to stir up the contents, either by means of a pole with a small board at the end, if the cistern is wide-mouthed, or again by means of a plunger vessel if the mouth of the cistern is narrow. This operation brings the solid substances into suspension and enables them to be raised at the same time as the liquid.

If this is not done, the solid substances will accumulate on the bottom, and their subsequent removal becomes a dirty and troublesome operation.

The stirring up of the liquid manure is attended by an escape of gas; this is no loss, because it would inevitably escape during the passage of the manure through the pump, and when it is dropped on to the dung heap or into the cask.

888 LUCAS, J. L. **Mechanical Milking.** (1). (La Traite Mécanique). — *La Vie Agricole et Rurale*, No. 6, pp. 133-136. Paris: 6 Janvier, 1912.

France

The Agricultural Society of Meaux has undertaken at the agronomic farm of Gournay-Sur-Marne under the direction of Mr. Mallèvre, Professor of Zootechnics at the National Agronomic Institute, a series of experiments on mechanical milking with the machines Wallace, Max and Alfa-Dalen, Loquist and Galakton.

The principle of the first two is suction; of the last three it is pressure.

The writer gives a detailed account of both kinds, and describes their application and use.

The effect of milking machines on the milk.

The suction machines do not drain the cows. The amount of milk left in the udders of cows with small teats is not more than a few grammes, but it is as much as 100-150 grammes, if the teats are large. This is perhaps due to the fact that these machines were made for Dutch or Danish cows, which usually have small teats. A remedy might be found in constructing special apparatus for the large teats of the Norman cows. The amount of milk left by the suction machines during a month's experiments varied from 5.4 to 8.5 %.

But with the pressure machines, almost the whole milk can be taken, only 1.42 % being left by the " Alfa-Dalen ". The " Loquist " and " Galakton " are still on trial.

The total amount of milk obtained by mechanical milking finished by hand was found to be equal to that given by simple hand milking. The apparatus did not in any way affect the quality of the milk.

For the suction machines it is necessary to wash the rubbers, after each milking, with a solution of soda, and keep them in salt water, and before use wash them with pure water. It is also necessary to wash the teats before applying the machine.

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(1) See *Bull.* Aug.-Sept-Oct 1911, No. 2778.

The pressure machines give the same result as hand milking; they leave in the milk a larger or smaller number of ferments, according to how far the teats and the hand or the milking plates are clean.

Time required for using these machines.

To milk by hand a cow yielding 14 litres (24.64 pints) an average of six minutes is required: a suction machine takes 8 or 8 ½ minutes, and a pressure machine 12 minutes.

The slowness of the machine is no defect; for it seems that the longer the milking, the more the milk.

With three suction machines 40 cows can be milked in two hours; while five pressure machines are required to milk the same number of cows in the same time. It is *possible* to do this, but practically the number of cows must be reduced to 30 In larger farms it is well to employ an operator and a cow-keeper. The operator keeps the apparatus clean, applies it, washes the udders, and helps the cow-keeper in feeding and cleaning the animals. The operator can attend to five " Wallace ", or three double " Max " machines, and milk in practice 60 cows. In this way there is a net saving of 30 % in labour.

With five " Wallace " machines, which involve an initial outlay of 5000 fr. (£200) the annual cost may be reckoned as follows:

Amortization at 10 %	500 fr.	or	£ 20	
Repairs etc.	500 »	»	» 20	
Interest on capital at 4 %	200 »	»	» 8 .	
Motive power, varying according to circumstances	420 »	»	» 16	16s.
1 operator at 180 fr. (£7 4s.) a month	2160 »	»	» 86	8s.
1 cow-keeper at 150 fr. (£6) a month	1800 »	»	» 72	
TOTAL	5580 fr.		£223	4s.

To do the same work three cow-keepers would be required at 1800 fr. (£72) each: total cost 5400 fr. (£216).

889 **France**

PAILLARD. **Sulphate Spraying beneath the Leaves.** — *Le Progrè agricole et viticole*, 32° Année, No. 48, pp. 648-650. Villefranche (Rhône), 26 Novembre 1911.

The author has, since July 1909, been experimenting with an appliance fór carrying out spraying with copper solutions beneath the leaves of the vine and on the grape bunches. It may also be employed for sulphur dusting, and may be of advantage in controlling Pyralis and Cochylis.

This appliance is a sort of racket fitted on the spraying or dusting nozzle. It has a handle 50 cm. (20 inches) in length and 2 cm. (4/5 in.) in diameter. The frame of the elliptical racket is formed by a brass tube. The surface of the ellipse is of brass wires parallel to the minor axis of the ellipse.

The workman passes the racket under the leaves in the lower part of the vine stock, so that the underside of the leaf is as near as possible to the brass wires of the blade. He then need only make an upward movement, pressing lightly on the leaves in order to raise them sufficiently, and, as soon as a bunch of grapes is cleared, he covers it with insecticide or copper liquid.

The work is done slowly with liquids. With powders it is more rapid, because once the leaves are pushed aside, the powder spreads sufficiently all over the bunches.

BUILDING-CONSTRUCTION.

890 **United States. Germany.**

Pig Houses. — *The Country Gentleman.* Vol. LXXVI, No. 3073, pp. 9 and 21. Philadelphia, 23rd December 1911. — *Ill. Landw. Zeitung.* 31 Jahrgang, No. 100, pp. 919-922, No. 104, p. 958. Berlin, 1911. — *Deutsche Landw. Tierzucht.* 15. Jahrgang, No. 41, p. 500; No. 43, p. 524. Hannover 1911. — HÖSCH, *Der Weidebetrieb in der Schweinezucht* Leipzig, 1906.

The pig house should provide the pigs with a dry and sufficiently warm shelter, but should not be too expensive, because rent and amortisation of the building capital diminish the net returns. If the pigs are put out to graze and are consequently hardened, very simple shelters will suffice. In America plain wooden huts are used for grazing pigs, consisting of a ridged roof, two gable walls with door and possibly windows, and a double floor. They have a clear height of something over 2 metres (about 6 ft.) a floor width of 2 ½ to 3 m. (8 to 10 ft.) and are portable. Harpending (1) keeps his herd of about 400 Berkshire pigs in piggeries of this kind throughout the year; the sows litter there. Hösch recommends sheds made of straw or reed for pigs put to pasture.

When the pigs are kept entirely in the sty, the latter will usually require to be of more substantial build. When erecting a pig house, choice must be made if possible of a dry site, and in a cold climate there must not be too much exposure to the wind. The enclosing walls are best built of brick, 1 ½ bricks in thickness. All hygroscopic bricks or stones are unsuitable; they get filled with absorbed moisture and are then constantly cold. The floor of the pigsties may be made of bricks laid on edge, the joints being filled with cement. Cement concrete floors do not so easily wear to holes as brick floors. but are only sufficiently warm if the ground is very dry and coal cinders are mixed with the concrete.

Provision must be made for the outflow of liquid refuse by giving the floor a steep slope (1 · 15) and by open gutters in the passages leading outside.

The roof must never be made too high; in small sized pig houses 2.20 m. (about 7 ft.) and in large ones up to 2.80 m. (9 ft.), so that the house keeps warm enough in winter. It may be made of wood with a layer of clay over it, or of a hollow brick arch between iron beams but without cement facing.

The windows should be made 0.8 to 1 sq. m. (8 to 10 sq. ft.) in size and provided with iron sashes. If too many, they favour cold in winter and heat in summer. For removing vitiated air provision may be made by air flues running vertically in the masonry; the end of the flue above the roof must be covered by a cowl and the lower end must be at a distance of about 1 m. (3 ft. 3 in.) from the floor. In this way the vitiated lower layers of the air of the piggery will be continually drawn off. The air supply may be suitably effected through flues likewise rising in the masonry outside, 1 metre from the ground, and opening inside, 0.50 m. from the roof; the bad air might also be removed by a fan, and fresh air simply let in through window apertures; a straw mat being placed in the latter to prevent draughts.

The outside walls being always very much subject to the action of the external temperature, passages 1.3 to 1.5 m. (about 4 to 5 ft.)

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(1) *The Country Gentleman.* Vol LXXVI, No. 3073, p. 21.

in width should be provided along them. It is best to form the partition between the sties of brickwork, in a ½-brick course, 1 m. (about 3 ft.) in height, faced with cement mortar. The area required for single sties for a breeding boar or sow without young, is at least 4 to 5 sq. m. (43 to 54 sq. ft.), for pigs fattened for the market and put several together in one sty, 1.6 to 2 sq. m. (17 to 21 sq. ft.) is sufficient, and for young pigs 0.6 to 1.2 sq. m. (6 ½ to 13 ft.) each. More than 15 animals should not be housed in the same sty.

The length of trough needed for a full grown pig is m. 0.35 (13.6 inches) for a younger pig m. 0.25 to 0.30 (10 to 127 in.) and for a sucking pig m. 0.20 (8 inches) in common sties. Glazed, hard-baked clay troughs may be regarded as the best; wooden troughs are also very suitable for sucking pigs owing to their lightness and to their being unbreakable, but they must be washed from time to time with lime-water. Painting with carbolineum should be avoided.

Breeding pigs and market pigs shou'd be kept in separate sties, because the latter need the utmost possible quiet and a lower sty temperature than breeding pigs.

It is advisable to have a room of sufficient size, about 0.4 sq. m. (4.3 sq. ft.) in or adjoining the pig house for preparing and cooking the food for the pigs.

891 De Condé, Fernand. **Concrete Silos** (1). (Silos en béton). — *Journal d'Agriculture pratique,* 75ᵉ Année, T. II, No. 50, pp. 758-759. Paris, 14 Décembre 1911.

France

The materials at present used for the construction of silos are wood, stone, brick, sheet iron and concrete.

The form generally adopted for all these silos is cylindrical, because it requires the minimum quantity of materials for a given capacity, and at the same time exposes the smallest surface to the air.

Wooden silos, though easy to build, deteriorate rapidly, they are likewise not proof against fire or insects.

Stone work gives good results if well constructed, but the stone is often permeable to air and moisture.

Brick silos are excellent, but their high price results in their being often passed over.

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(1) See *B.* Nov.-Dec. 1911, No. 3225. (*Ed.*).

The fact of sheet metal being attacked by the acids in the forage also disqualifies metal, notwithstanding its great advantage of impermeability.

Concrete silos are those which appear to give the best results; the low cost price has resulted in their adoption. The only drawback is that the silage runs the risk of freezing, but with proper precautions this can be avoided.

The walls of the silo are made 15 cm. (6 in.) thick and are stiffened outside to resist external pressure caused by the wind, and internal pressure due to the weight of the forage.

Openings are provided at suitable points for repairs.

The inside diameter of the silo should be something near one half its height. It may be less, but making it in excess of half the height should be avoided.

The following table gives the capacity in tons (of 2 000 lb.) of the silos of ordinary dimensions used for green maize.

	Height of Silo Feet					
Inside diameter. Feet.	30	33	35	37	39	41
10	36	40	44	50	53	57
12.	52	61	68	72	77	82
14.	68	81	60	95	108	114
16	96	108	115	120	142	158
18.	122	137	150	162	171	194
20	136	160	180	200	223	230
22.	173	205	226	248	269	290
24.	206	245	270	295	313	341

The silage after settling should reach to about 5 feet from the top of the silo.

RURAL ECONOMICS.

892 DR. THIEL. **A New System of Tenure as Carried out by the Administration of the Prussian State Domains.** — *Aus der Domänenverwaltung*. Vortrag gehalten im Klub der Landwirte in Berlin. — *Nachrichten aus dem Klub der Landwirte in Berlin* 21 Dez. 1911.

Germany

This paper is a description of the results obtained during the last six years by the new system of tenure adopted in the Domain of Schlanstedt, where, in order to protect the tenant against the variation of prices of the chief staples, the conditions of tenure have been regulated according to a sliding scale dependent on the prices for the time being. A normal rent was 85 000 Mk. (£4 250); of this the fixed sum of 30 600 M. (£1 530) had to be paid every year in ready money, while the balance of 54 400 Mk. (£2 720) was payable according to the prices of the following products: sugar, 40 %; wheat, 14 %; and alcohol, 10 %. The *normal* prices were taken as follows: sugar at a normal price for 50 kg. (110.23 lbs.), unrefined first product yielding 88 %, without sack, and without tare, as fixed by the Magdeburg Exchange, 9.50 Mk. (9*s.* 6*d.*); wheat at 150 Mk. (£7.10*s.*) per metric ton (2204.6 lbs.); and alcohol at 40 Mk. (£2 for the percentage of absolute alcohol contained in 10 000 litres (2 200.96 gals.).

According to this method, the tenant had to pay for the year 1904-5, 100 354 Mk. (£5019,, 4*s.*); for the following year only Mk. 82 394 (£4 119,, 14*s.*); for 1906-7, 85 404 Mk. (£4 270 4*s.*); for 1907-8 93 393 Mk. (£4 669 13*s.*); for 1908-9, 93 828 Mk. (£4 696 8*s.*); for 1909-10, 102 520 Mk. (£5 126); giving an average of 93 004 Mk. (£4 650 4*s.*). For the wheat the increase of rent was from 9 to 12 %, for the sugar 16 to 23 %, for the alcohol 22-24 %; in the case of the latter there was during two years a reduction of from 20 to 24 % on the rent as fixed.

In order to form a right judgment of this system it is necessary to realise what part the tenant plays in connection with the total agricultural outlay. For this purpose Dr. Thiel refers to some figures obtained from the books of those estates which submit their accounts to the Deutsche Landwirtschaftsgesellschaft. From the table given below it is seen that in the case of twenty-four estates the conditions of tenure in the year 1907-8 varied in percentage of the receipts between 4.6 and 17.4 % ; and in percentage of the expenditure, between 2.9 and 23.7 %, in each case according to the intensity of cultivation. Especially to be noted is the high average proportion (varying from 20 to 62 %) of the cost of labour per hectare (2.4711 acres), as compared with the total expenditure.

It is this (the cost of labour) which forms the most difficult point in calculating the price of rent. To guarantee the tenant against all oscillations, not only the possible variations in the receipts have to be considered, but also the variations in the expenditure; of which latter the cost of labour is the most important item. It is true that taxes and insurance are items which also belong to the category of sliding expenses, but these do not figure in the tenant's budget with anything like the same importance as the constantly increasing cost of labour. Unfortunately it is just this factor which it is impossible to bring into the calculation. To say nothing of the difficulty of reckoning the outlay in wages, especially when paid in kind, there is no means of determining whether the figure reached in the wages item is economically justifiable, whether, for instance, too many labourers were kept, whether their pay really corresponded to the given conditions, etc. ; for superfluous expenses can never be made a ground for reducing rent. To recognise increasing expenditure on labour as a justification for reduction of rent would only set a premium on bad economic management.

In this respect, therefore, no guarantee can be given; but the intention of the system here described is to protect, at least to some extent, the tenant during the period of his tenure, which is fixed at 18 years, from the consequences of the fluctuation in prices, especially as regards those products, whose prices depend directly on the State customs and taxes.

This new system has, however, met with much adverse criticism, nor do the tenants themselves view it with any favour, and for this obvious reason: the more the tenant is exposed to the fluctuations of an uncertain business during a long period of time, the higher he will estimate the risk, and the lower will be the conditions he is prepared to accept. In fact such a risk, extending, as it does over 18 years, can hardly be run except by people who are very well off. Consequently Domain tenures are almost exclusively in the hands of moneyed farmers. It is however certain that the more the tenant could be guaranteed against fluctuations, the larger would be the number of those who could farm large domains on a small capital, and the greater would be the competition — on the basis of the land tax, using the factor 60 to obtain the value. Later Professor Aereboe was instructed to control these figures for the various political districts of the Kingdom. He made use of all the available material of the Ministry of Finance and of the land registry offices and succeeded in determining for certain districts some factors to be used in connection with their existing land registration which is always the basis of all valuation. The fact that this new system of tenure may be injurious to the tenant, when a bad harvest coincides with high prices, is a drawback to it that cannot be denied; for it contains no provision fixing a rent limit in case of such emergencies.

Dr. Thiel then turns to consider the question whether it is financially advantageous for the State to possess large estates. In affirming that it is, he remarks that it is always good that there should be a thoroughly well managed estate in the different provinces, to serve both as a model and an incentive to industry.

The total value of the 1 180 Domains belonging to the State, was in 1909, 507 583 092 Mk. (£25 379 154 12*s*). From Prof. Aereboe's results the interesting fact has emerged that the prices are relatively higher in proportion as the properties are smaller, and the soil lighter. This is only a fresh confirmation of what is now well known, namely, that no side of German agriculture during the last 20 years is so satisfactory as that dealing with the improvement of light soils which have consequently shown a remarkable rise in value.

By means of these factors thus obtained the value of the State domain is confirmed to be 507 000 000 Mk. (£24 821 875), which represents a gross rental value of 16 000 000 Mk. (£783 333), or an interest at the rate of 3.14 % (gross value).

The following figures were furnished by Dr. Stieger·

Prussian State Domains. Statistics for 1907-1908.

Province	Total Area acres.	Total Rent £	Total Receipts per acre £	Total Outlay per acre £	Wages per acre sh.	Wages in Percentage of total outlay	Rental per acre sh	Rental in Percentage	
								of receipts	of outlay*
Hanover	514.78	925.7s	16 74	11.40	68.07	29.9	35.95	10.7	15.8
Hessen	413.91	675	20.46	18.46	74.71	20.2	32.62	8.0	8.8
Schlesw.-Holst.	454.68	516 5s	6.51	5.31	33.94	32.0	22 71	17.4	21.4
» »	1719.54	2500	9.39	7.05	37.61	26.7	21 72	13.1	15 4
» »	587 08		7 24	5.64	35.57	31.6		13.1	19.3
Saxony	1069.99	1135	7.69	5.63	53.66	47.7	21.23	13.8	18.9
Mecklenburg.	687.86	655	11.22	8 54	58.89	34.5	19.04	8.5	11.1
Bavaria . . .	238.68	200	6.87	6.61	27.45	20 8	16.76	12.2	12.7
Mecklenburg. .	2372.26	1890	4.81	2.37	27.91	59. ›	15.94	16 6	23.7
Posen.	1514.78	1130	8.39	6.49	37.56	28.9	14.92	8.9	11.5
»	933 58	650	4.40	3.93	38.81	49.4	13.92	15.8	17.7
Reuss	680 07	465	5.92	4.54	36.88	40.6	13.67	11 6	15.1
Silesia	812.25	500	5.55	4.24	33.84	39.9	12.31	11.1	14 5
Pomerania . .	674.91	400	4.55	2.69	36.53	68 0	11 85	13.0	22.1
Reuss.	309.33	178.10s	8.04	5 90	49.29	41.8	11.54	7.2	9.8
Mecklenburg. .	1309.68	750	3.74	3.60	26.08	36.3	11.45	15.3	15.9
Brandenburg .	996.35	548.10s	9.86	8.20	43.61	26.6	11.01	4 6	6.7
»	1606.22	814	5.53	4.58	34.31	37.4	10.14	9.3	11.1
»	2086.47	1000	4.59	5.09	39.48	38.8	9.59	10.4	9.4
»	462.10	215	6.28	5.85	29.62	25.3	9.30	7.4	8.0
»	1021.38	450	3.60	3.06	26.49	43.3	8.81	12.2	14.4
»	2986.70	1300	3.90	3.24	26.79	41.4	8.70	11.2	13.4
Hanover	1339.95	500	3.59	2.24	18.16	40.4	7.43	10.3	16.6
Brandenburg .	364.49	75	4.35	7.22	5.52	38.2	4.12	4.7	2.9

* This column indicates the percentage of outlay, i. e., expenses not including the rent.

898 **Subdivision of Property and Farming Tendencies in the Province of Posen during the Years 1906-1910.** (Die Entwicklung der Landwirtschaft der Provinz Posen in der Zeit von 1906-1910). — *Bericht der Landw.-Kammer für die Provinz Posen,* 1 Brosch., pp. 144. Posen, 1911.

Germany

The census of 1885-1907 proves that in the province of Posen the number of large farms has fallen off noticeably. The following table shows this transformation during the period between 1895 and 1907.

Farms in the province of Posen and their area in 1895 and 1907

Farm area	Number of Farms		Increase or decrease	Total area in hectares		Increase or decrease, hectares	Area under cultivation hectares		Increase or decrease
	In 1895	In 1907		In 1895	In 1907		In 1895	In 1907	
1. Less than 5 acres	125 963	112 956	— 13 007	66 748	69 414	+ 2 666	58 898	55 915	— 2 983
2. From 5 to 12 ½ acres	23 678	25 888	+ 2 210	87 933	103 812	+ 15 879	76 687	85 347	+ 8 660
3. From 12 ½ to 50 acres . . .	41 125	51 065	+ 9 940	448 132	656 721	+ 168 589	434 883	562 721	+ 127 838
4 From 50 to 250 acres . . .	12 638	12 738	+ 100	530 633	550 167	+ 19 534	427 829	439 838	+ 12 009
5. Over 250 acres	2 605	2 305	— 300	1 429 610	1 175 364	— 254 246	1 089 452	901 027	— 188 425
Total . .	206 009	204 952	— 1 057	2 603 056	2 555 478	— 47 578	2 087 749	2 044 848	— 42 901

Intensive cultivation, the money market and facilities of comunication, exercise a great influence on land values, nevertheless the demand remains brisk and at high prices. At the present time not only are many farmers selling who wish to retire and lead a tranquil life, but land is also put on the market by those intending to repurchase it in Silesia and Eastern Prussia. There should be noted above all the great falling off in small holdings of less than two hectares (13 007). The lands and farms best adapted to dividing up into small holdings are most in demand. Generally speaking, however, though land still fetches more than its value, consideration is beginning to be given to the bad climatic conditions, the damage which is so very often caused by drought or excessive rains, cattle diseases, increased cost of labour, and the large capital generally required at the present day for the farming industry.

Rents have also gone up to a noteworthy extent. Exact figures are only available for the State Domains. The following table gives us the average rental per hectare of these domains from 1907 to 1910.

Year	Area. Hectares	Revenue. Francs	Revenue Per hectare Francs
1907	48 846	1 754 850	35·92
1908	50 004	1 852 227	37·03
1909	49 335	1 934 620	39·20
1910	50 245	2 012 675	40.05

(10 francs per hectare = 3s 2d per acre).

There has been no notable change in the direction of production during these latter years. In horse breeding, army remounts are the main item. In cattle breeding large farms give their chief attention to fattening for the market, being under the necessity of utilising the by-products of the industries connected with the undertaking; while on small and medium farms breeding proper and the dairy industry hold the leading place. Pig breeding is in process of large increase owing to the exportation of young pigs to Silesia; nevertheless fattening for the market is likewise on the increase. Farming, in the strict sense of cultivation, is undergoing a transformation in the direction of a more intensive agriculture, in which cultures requiring the hoe predominate, and the ever-growing use of machinery tends to displace labour and reduce its cost. The Agricultural Chamber of the province of Posen has above all endeavoured to extend rational systems of agricultural account-keeping among the farmers, and also the peasants; the results already obtained are remarkable. This year the Agricultural Accountancy Station will begin operations; it was founded with the object of facilitating the introduction of analytic methods of account-keeping on large farms.

Special interest attaches to the establishment of prizes for well managed farms, particularly small farms managed by the peasants themselves. The method adopted is that of awarding a certain number of points according to merit, which are divided over 11 questions in the following way :

1. Farming conditions of the cultivated land (arable and grass)	15
2. Improvements effected on the arable and grass-land	30
3. Subdivision of fields and rotations	25
4. Forage crops	25
5. Horticulture, fruit growing and poultry keeping	20
6. Live-stock (viz : cattle 40 ; horses, pigs, etc., 20).	60
7. Keeping and preparing farmyard manure	50
8. Dairy industry and domestic economy	30
9. Upkeep of buildings	15
10. Condition and quality of implements	15
11. Condition and quality of the farm as a whole, including system of book-keeping and net profits derived	15
Total	300

Farms not scoring 200 points are not entitled to the first award ; for the second and third award at least 100 points are required.

894 MARCHETTANO, E. **The Alpine Pastures of Carnia and the "Canale del Ferro", in Friuli** (I pascoli alpini della Carnia e del Canale del Ferro in Friuli). — *Associazione Agraria Friulina, Estratto dal Bullettino*, 1 Vol. pp. XV + 150, ed 1 Carta geografica. Udine, Dicembre 1911.

Italy : Friuli

The Agricultural Association of Friuli has collected in one volume the studies by the Author on this question in the Bulletin of the Association, with a view of thus taking a first step towards an enquiry which would result in providing accurate ideas and data as to the economy of the alpine region of the province. These ideas are the more desirable inasmuch as they concern the most neglected and least known part of Italian rural economy.

The regions of Friuli situated at the limit at which trees grow, and in particular those above this limit, have from time immemorial been used exclusively as summer pasturage on the system of more or less primitive "Malghe". (Malghe is the local term for farmed-out alpine pasture lands). Where wood and grass lands were intermingled they were formerly both grazed. The forest laws have since granted special protection to the forest areas, sometimes to the detriment of pasture land and even to the general prosperity of certain regions, so that the interests of the forest and of the grass lands are almost opposed to each other. But the time will come when the liens on forest lands and the prohibition of grazing them, will be limited, by a wise economy, to those regions alone which need the woods for the protection of the mountain sides and plains against the ravages of water, and where the forest, owing to its situation, is more remunerative than pasture land ; then, and after the removal of all restrictions from those regions in which there is no reason for keeping them up, grass lands and forest, freed from conflicting interests, will both contribute to the economic progress of Friuli.

Carnia comprises the valleys of the But and the Degano, which empty into the valley of the Upper Tagliamento ; its area is 1228 square kilometres (474 sq. miles). The Canale del Ferro comprises the valley of the Pontebba and that of the Fella, which likewise empties into the Tagliamento at Stazione per la Carnia. The principal products of these regions are those derived from agriculture, cattle-breeding and from the forests, but they do not suffice for the support of the population because about 12,000 persons still emigrate temporarily every year. On $^4/_5$ of the producing area, the cultivated soil represents hardly 2786 hectares (6 882 acres) and the grass lands and pasturage, without counting the " malghe ", 50 498 hectares (124 731 ac.), the " malghe " 23 472 hectares (57 976 ac.) and the forests 36 982 hectares (91 346 ac.).

The 1908 census gives the following figures for the cattle with which agriculture is most concerned :

	Oxen	Goats	Sheep	Pigs
Carnia	21 108	5 523	3 519	3 374
Canale del Ferro	4 102	2 354	846	257

The above figures, particularly as regards cattle, however, do not represent more than $^2/_3$ or at most $^3/_4$ of the number of animals which the region normally possesses. In 1908, the year of the census, which was carried out on the 25th March, all the breeders had cleared their stables as much as possible owing to the extraordinary scarcity of forage.

Carnia numbers 72 winter dairies which handle 3 to 10 quintals (660 to 2 200 gals) of milk per day, and are of immense benefit to the region. On the other hand, in the 7 communes of Canale del Ferro there is not a single dairy.

Carnia numbers 164 " malghe ", the Canale del Ferro 16, and all of them together sent out to the alpine pasture lands, an average of 18 700 normal head of cattle. The area of the " malghe " varies greatly ; they are equipped with the necessary buildings for making cheese and for sheltering the herdsmen, together with sheds for the animals, which graze there for 75 to 80 days. As to the productivity of the pasturages it may be reckoned that one hectare (2.47 acres) of pasture land can on the average feed one head of large cattle for 40 days ; in good " malghe " this figure rises to 60 days and in some special cases even to 100. In some " malghe " in the Canale del Ferro it drops to 10. The question of pasturage for goats is still in an acute phase in Carnia ; the forest restrictions which prohibit the peasants from keeping more than 3 goats, and this only in those cases where cattle cannot be kept, have resulted in the " malghe " being depopulated of goats, which were very productive, because they kept their milk during the entire alpine season, while the cows, the majority of which are in the 7th and 8th month of gestation, soon lose it. A number of " malghe " are unable to find any tenants owing to the shortage of goats and the law prohibiting pasturage. In 1903, fifty four mayors signed a petition to Parliament for a revision of the forest restrictions and goat grazing ; but this petition was not attended by any success.

The " malghe " which belong to the communes or to associations are let out by public auction. Communal " malghe " are also at times worked by the commune itself, and others rented by groups of winter milk producers ; the latter system deserves to be more fully extended. The specification of conditions of renting is certainly not calculated to encourage the tenants to make any improvements ; under the contracts no allowance is made for improvements although the tenant is bound to leave the buildings in the same condition in which received by him. No allowance is likewise made for the improvement of pasturage, resulting from a rational use of animal or mineral manure, nor the improvement of roads. Until these conditions are modified the mountain region cannot be expected to effect real economic progress. Nor is this all ; the renting contracts are made for a maximum period of 9 years or a minimum of three, which does not even allow the tenant to benefit by the improvements he may have made.

On the other hand in the " malghe " which are directly worked by intelligent owners, remarkable progress is observed.

In the " malghe " there is almost exclusively manufactured a kind of fat cheese called " Montasio ", which is greatly esteemed in trade and is eaten fresh or kept even three years. One quintal (22 gals.) of "malghe " milk containing from 4 to 4.5 % of fatty substances yields 11 to 12 kgs. (24 to 26 lb.) of fresh cheese and 3% of "ricotta " (casein coagulated from the whey). The whey is used for feeding pigs. The cost of the fresh cheese varies from 180 to 200 fr. per quintal (72*s*. 5*d* to 80*s*. 5*d*. per cwt.).

Contracts made between the " malghese " (the lessor of the " malghe ") and cattle owners vary somewhat according to the locality ; but the principle which dictates the traditional conditions of the contract relating to milch cows is the following · it is reckoned that one-half of the milk represents the consideration which the owner of the cattle owes to the " malghese " for feeding, supervision, management, etc. of the milch cows ; the other half of the milk is bought by the " malghese ", who pays for it in cash to the owner of the cattle. In practice, the following is the method adopted· one month after the beginning of mountain pasturage, about the 25th. July, the " malghese " weighs the milk which each cow yields in the two daily milkings ; the respective owners invited for that purpose, may be present at the operation. The two milkings are totalled and one-half of this total represents the milk for which the cattle owner must receive payment. For each kilogramme (2.2 lb.) thus obtained, the " malghese " pays the cow owner a sum of money previously fixed, which usually varies from 4.50 to 9 fr. (3s. 6 3/4 d. to 7s. 1 1/2d.) according to the quality and position of the land, the duration of Alpine grazing, etc., so that it is only when the upland grazing reaches 90 days (a rare case) and when the total is 9 fr. (an equally rare case) that the milk attains the price of fr. 0.10 (1*d*) per kg. (2.2 lb.).

The price which the " malghese " receives for cows yielding less than 1/2 litre (0.88 pints) of milk in the weighing is 10 to 12 fr. (7*s*. 11d. to 9*s*. 6*d*). For heifers of the third grazing this price is 6 to 7 fr. (4*s* 9*d* to 5*s* 6 1/2*d*), for those of the second grazing 4.50 to 6 fr. (3*s* 6 3/4 *d* to 4*s* 9*d*) for heifers of 7 to 9 months it is 2.50 to 3 frs. (1*s* 11 3/4 *d* to 2*s* 4 1/2 *d*). The low production in relation to the forage consumed and the increase of wages makes the position of the " malghese " an unenviable one. For sheep the charge is fr. 1 (9 1/2 *d*) per head, for pigs it is fr. 4 to 6 (3*s* 2*d* to 4*s* 9*d*).

For each goat the " malghese " pays 10 to 12 fr. (3*s* 2*d* to 4*s* 9*d*) or by weight fr. 9.50 to 10 (7*s* 6 1/4 *d* to 7*s* 11*d*) per litre of milk weighed.

In the " malghe " of Montasio, on the contrary, other conditions are customary.

The owner of the milch cows receives from the " malghese " a proportionate quantity of cheese corresponding to one-half the production of milk (ascertained at the end of 8 to 10 days after the beginning of mountain grazing) ; it is assumed that 1 kg. (2.2 lb.) of milk weighed corresponds to 12.51 kg. (27 1/2 lb.) of cheese for 100 days mountain grazing. If this grazing does not last so long, the subtraction is made proportionally to the number of days less, at the exact rate of 0.144 kgs. (0.217 lb.) of cheese per litre of milk per day less ; finally, from the quantity of cheese thus found there is deducted 2.500 kgs. (5 ½ lb.) per cow, a figure which would represent an equivalent quantity of fresh " ricotta " which the " malghese " must in addition to the cheese give the owner of the cow. There are also deducted 20 % for salting, upkeep, and waste until the 29th. September, the date of delivery. Finally, while the " malga " is evacuated on the 7th. September, the " casaro " (cheese maker) remains there until the end of September with a caretaker, and he allows his own animals and those of the " malghese " to eat the remaining pasturage as well as the small quantities of hay reserved for bad autumn days.

The co-operative working of communal " malghe " includes certain practical applications which deserve mention. At Forni di Sotto all the " malghe " are worked by the social dairy for all the members or members of the commune, which prevents speculation and depreciation of the " malghe ", by allowing improvements to be made and the cheese industry to be conducted more economically Milch cows and heifers in calf at their third grazing season are placed in the best " malghe " ; those of the second grazing go to the others. A commission consisting of a chairman and two members supervises the proper distribution of the animals. Each " malga " keeps its separate accounts and the working expenses are divided among all the members proportionately to the cattle grazed. The salary of the cheese makers, who are also members, is proportionate to the milk produced and the produce is also divided in the same way. The tax levied by the commune is fr. 2.80 (2*s* 2 ½*d*) per head of cattle, fr. 1.15 (11*d*) per second grazing heifer, and fr. 0.80 (7½ *d*) per calf. Improvements are paid for by the members, who for that purpose pay a duty of fr. 1 (9½ *d*) per head of large cattle and fr. 0.50 (4 ¾ *d*) per heifer. The commune pays for new buildings and repairs to the old ones. The " malghe " in Forni are thus greatly improved. For the cheese making the same staff are employed as in the social winter dairies ; the weighing of the milk is carried out three times during mountain grazing, and the average of the three weighings determines the distribution of the produce.

Another system of co-operation has been in operation in the commune of Pontebba since 1898. The management is entrusted to two directors, who remain in office for 3 years. The commune levies fr. 10 (7*s* 11*d*) per cow, fr. 8 (6*s* 4*d*) per heifer and fr. 6 (4*s* 9*d*) per calf under one year. At the time of handing over the animals the owner pays a part of the tax in advance. Sheep are free from communal tax, but they pay fr 1 (9½ *d*) per head to the administration and fr. 2

(1*s* 7*d*) per milch ewe participating in the distributing of produce. The expenses of cheese making are distributed among the owners of the stock. The directors receive 1 kg. of cheese per milch animal and ½ kg. per non-milch animal. The cost of labour and herdsmen shows continual increase. They receive a wage ranging from fr. 140 to 150 (110*s* 10*d* to 118*s* 9*d*) for the whole season; children's wages are from fr. 40 to 50 (31*s* 8*d* to 39*s* 7*d*). To this may be added the costs of keep, which may be estimated at fr. 1 (9 ½*d*) per day. The cheese maker who is the chief and the manager of the grazing, receives in money 40 to 50 fr. (31*s* 8*d* to 39*s* 7*d*) more than the herdsmen besides his food, being about 180 to 200 fr. (142*s* 6*d* to 158*s* 4*d*) for 3 months.

In Carnia, on Alpine grazing land of average area, *i. e.* capable of supporting about 150 head of normal cattle (100 cows, 30 calves of different ages and 80 goats) we may calculate the following approximate account of receipts and expenditure under average conditions of fertility and weather.

Credit.

Dairy Produce exported from the "malga":					
Fresh cheese, kg. 2400 (5290 lb.) at fr. 1.90 (18.05*d*)	Fr.	4 560.00	£ 180	9*s*	8*d*
Butter, kg. 40 (88 lb.) at fr. 2.50 (12.35 pence)	»	100.00	£ 3	19*s*	2*d*
"Ricotta", kg. 200 (440 lb. at fr. 1.30 23.75*d*)	»	260.00	£ 10	5*s*	9*d*
Alpine Grazing Charge.					
First calf Cows, 8 at fr. 10 (7*s* 11*d*) .	»	80.00	£ 3	3*s*	4*d*
Heifers and calves	»	100.00	£ 3	19*s*	2*d*
Cows drying off	»	20.00	£	15*s*	9*d*
Pigs	»	30.00	£ 1	3*s*	9*d*
Total credit .	Fr.	5 150.00	£ 203	19*s*	20*d*

Debit.

Renting, annual payment	Fr.	1 200.00	£47	9*s*	10*d*
Expenses of auction and agreement	»	10.00		7*s*	11*d*
Carried forward .	Fr.	1 210.00	£47	17*s*	9*d*

Brought forward .	Fr.	1 210.00	£47	17*s*	9*d*
5 Shepherds, including one goat herd, wages for 80 days in the uplands, average fr. 180 (£ 7.2*s* 6*d*) each .	»	750.00	£29	13*s*	8*d*
Young shepherds, 2 receiving fr. 45 (35*s* 6*d*) each	»	90.00	£ 3	11*s*	3*d*
Cheese maker	»	200.00	£ 7	18*s*	4*d*
Maize flour, 7 quintals (14 cwt.) at fr. 24 (9*s* 8*d*)	»	168.00	£ 6	13*s*	—
Milk paid for to animal owners .					
One-half of the produce of 100 cows weighed on the 30th. day of mountain grazing, kg. 150 (352.6 lb.) at fr. 6. (2*s* 2*d*)	»	960.00	£37	19*s*	10*d*
One half of the produce of 80 goats, weighed as above, kg. 40 (88 lb). at fr. 12 (4*s* 4*d*)	»	480.00	£19	0*s*	2*d*
Salt for salting the cheese and maize porridge ; salt for cattle (1.20 quintals, 264 lb., of the former and 3 quintals, 660 lb., of the latter)	»	84.00	£ 3	6*s*	6*d*
Rennet	»	7.00		5*s*	6*d*
Conveyance of implements and provisions to the " malga ", 7 quintals (14 cwt.) of flour, 4.20 quintals (8¼ cwt.) of salt, straw, wine, etc.	»	43.00	£ 1	14*s*	--
Conveying dairy products to a distance from the mountain, 28.50 quintals (56 cwt.) at fr. 2.50 (1*s* per cwt.)	»	71.25	£ 2	16*s*	5*d*
Upkeep of buildings and roads . .	»	200.00	£ 7	18*s*	4*d*
Interest and amortisement of equipment capital (12 % on 150 francs, £5 18*s* 9*d*)	»	18.00		14*s*	3*d*
Interest on capital paid for rent in advance (5 % on fr. 2 000, £79 3*s* 2½*d*, for 6 months)	»	50.00	£ 1	19*s*	6*d*
Management and administration, about 3 % on the amount of gross produce	»	160.00	£ 6	6*s*	8*d*
Carried forward .	Fr.	4 491.25	£177	17*s*	6*d*

Brought forward	Fr.	4 491.25	£ 177	17*s*	6*d*
Travelling of the "malghese" for supervision the whole of the work, entering the animals, etc.	»	150.00	£ 5	18*s*	9*d*
Personal property tax and license	»	45.00	£ 1	15*s*	7*d*
Sundry expenses (gratuities, wine, etc to shepherds)	»	40.00	£ 1	11*s*	9*d*
	Fr.	4 726.25	£187	3*s*	7*d*
Net profit	Fr.	423.75	£ 16	15*s*	7*d*
Equivalent total	Fr.	5 150.00	£203	19*s*	2*d*

Without goats, a "malga" of this kind would yield 500 to 600 kg. (9.8 to 11.76 cwt.) of cheese and 50 (1 cwt.) of "ricotta" less, *i. e.* after deducting the expenses, frs. 300 (£11 17*s* 6*d*) less. That is why the "malghese" complains strongly of the disappearance of the goats, which has indeed caused great damage to alpine culture in Carnia; to make up for this damage endeavours must be made to increase the milk production of the cows by improving the breeds, and the conditions of their mountain grazing should be improved and made more productive.

To facilitate this enquiry into the economic conditions of the "malghe" of the Alpine pasture lands in the province of Udine, the Agricultural Association of Friuli has distributed to the communes and "malghese" the same question sheet as is used by the Swiss Society of Alpine Economy. It has not always been possible to fill in this form even by means of inspection on the spot, owing to the disinclination which some "malghese" showed as to giving precise information about the number of cattle and the quantity of milk and cheese products. The data already collected about the "malghe" of Carnia and the Canale del Ferro, and those collected every year by the travelling lectureship of Tolmezzo will form a considerable basis for arriving at a knowledge of alpine culture of Carnia. The travelling lectureship of agriculture of the province of Udine also proposes to open a competition among the "malghe" in the districts of Tolmezzo, Ampezzo and Moggio as soon as it is able to obtain the necessary grant from the Government.

B. *The contractor possesses only a part of the capital of the concern, and provides the work of organisation, and the labour.* This case applies in practice to the small lease-holders. The gain or profit includes : *the whole or a part of the industrial profit, according as the whole or only a part of the capital employed belongs to the contractor ; the circulating capital ; the labourers' wages; the profit in the strict sense.*

C. *The contractor possesses only a part of the capital of the concern, and employs paid labourers* This case applies to tenures on a large scale. The profit includes the whole or part of the *industrial profit,* as in the preceding case ; *the circulating capital; the remuneration for the work of administration ; the profit in the strict sense.*

If the contractor — and this is a very rare case -- possesses no capital invested in the estate, and has recourse to credit for his equpment, as well as circulating capital, and entrusts to specialists the work of organisation and administration, it is only then that the term *profit* acquires the restricted meaning of autonomous income, which constantly tends to zero.

The profit of the small working proprietor differs, therefore, very widely — to speak only of agricultural industry — from that obtained by the other classes of agricultural contractors ; and this is because the coefficients of production brought to the undertaking vary in each case, both as regards quality and quantity.

4. — The profit varies also according to what may be called the economic psychology of each contractor. Supposing for instance that a concern may be organised according to the types A, B, or C.... ; and that the forecast of profits is respectively M, N, and P,.. ; this does not mean that all the contractors should choose that type where the profits are likely to be larger.

It is well known in fact that the forecasts on which economic estimates are based, always have a side which is more or less uncertain and contingent upon circumstances. (1)

For which reason the choice of the cultural organisation partly depends on subjective factors. Thus, the man who likes sure investments, is satisfied with a minimum profit, provided it is certain; while the one who dreams of large profits, and has no fear of risk, makes arrangements which promise, even if with some uncertainty, the maximum gain.

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(1) Thus, speaking generally, it may be said that the risk alluded to in the text is relatively low for herbaceous and ordinary cultures, but high for trees

The choice of the cultural organisation depends therefore in part on *economic courage*. But there are other economic factors which play their part; and among these should be noted the way in which individual contractors forecast the events which are of importance to the concern.

In the preceding considerations it was assumed, for the sake of simplicity, that the profits, relative to various possible organisations of a given concern, should have, all of them, the same degree of probability. But this does not precisely correspond to the reality. The forecast of economic events does not properly belong to *objective or mathematical probability*, but rather to *subjective and statistic probability*. (1)

5. — The conclusions that may be drawn are very simple.

When it is necessary to draw up estimates of economic advantage with regard to this or that cultural organisation, it is impossible, logically, to follow the same criterion in all cases.

Thus, if in the case of a small working proprietor, we should consider the profits to be represented by the difference between the sum total of the produce and that of the outlay (taking into account his own work and that of his family, the profit arising from the land, the industrial profit, etc.) we should inevitably reach arbitrary results, in favour of this or that particular set of crops;

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(1) There are three different conceptions of probability. The first is entirely *subjective*, and is the one which mostly occurs in general language, the second is *objective* or *mathematical*; the third is *statistical*, and is intermediate between the first and the second.

By probability in the objective sense is understood the relation between the number of cases which favour the happening of an event, and the number of possible cases. Probability in the ordinary sense, or subjective probability, is the measure of the confidence with which we may expect the happening of an event that cannot be submitted to calculation

By probability in the statistical sense is understood the relation between the cases of a given phenomenon that have actually occurred, and those which on some hypothesis might have done so. This relation, which results from observing the past (objective side) forms the basis for forecasting the future (subjective side); it is for this reason that statistical probability on one side touches mathematical, or objective probability, and on the other side the common, or subjective. (Cf. R. BENINI: *Lezioni di statistica metodologica dette nell'Università di Roma l'anno accademico* 1907-1908, ecc., pp. 42-49; 273-282).

because the small working proprietor has essentially in view the total income that belongs to him, and not the profit in the strict sense. Whence small working proprietors, as a rule, think it desirable to substitute one culture for another, if this leads to an increase of income; even should the change mean harder work for the family, and perhaps without corresponding remuneration, in accordance with average wages, as under the given conditions of place and time. (1)

What is true for the small landowner is true also — with the necessary modifications — for all the other kinds of contractors. Every one, in short, is interested in making as large as possible, not the profit in the strict sense of the word, but the income that is due to him, after all the actual expenses have been paid, or, in other words, the remuneration for the production coefficients which he brings to the concern. These coefficients are of very different kinds, being either untransferable (*e. g.*, capital invested in the land), or transferable, but with great loss in transformation (*e. g.*, machines, implements, etc).

Under equal conditions, there are moreover — as explained above — psychological reasons, which may be called economic courage and timidity, and which have a great effect on the *modus agendi* in agricultural economics there being always more or less risk in the latter, according to circumstances.

And this is not all. The same nation, the same individual, does not always see and judge, economically speaking, according to the same criteria.

These and other reasons, which must be omitted for want of space, clearly show that it is impossible, logically, to speak of economic advantage in general terms, but that each case must be judged separately.

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(1) This happens, as a rule, when there is no way of utilizing, outside the farm, the possible surplus of manual labour; a thing which often happens in districts where the land mostly belongs to small working proprietors; and also when (assuming that the possibility exists) to work for others is considered derogatory; this is due to exaggerated *amour propre*, which is found sometimes in the peasant proprietor.

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Laur, Ernst. Theoretical Contribution to the Study of Farm Economy. (Theoretisches zur Wirtschaftslehre des Landbaues). — *Fühlings Landw. Zeitung*, Heft 1. Stuttgart, 1. Januar 1912.

Switzerland

The author subjects to a critical examination Brinkmann's article, published in *Fühlings Landw. Zeitung*, Jahrg. 10, Heft 21 (1). The Author shares Brinkmann's opinion that the distinction between land capital and working capital adopted up to now (Grund-bezw. Gutskapital und Betriebskapital) is entirely wrong. The nature and capital represented by the landed property (Grundkapital) is unquestionably affected both by labour and its products, and therefore the last named form part of the working capital (Betriebs-Kapital), just as capital which is used for working the materials and forces of nature.

Therefore, while agreeing with Brinkmann as to what should be meant by working capital (Betriebs-Kapital), Laur does not see why he does not accept the term " Gutskapital " — land capital or value of the farm — for the totality of the factors: estate, improvements, buildings and plantations. For all other capital Laur has adopted the term " Pächterkapital " or tenant's capital.

If this denomination were adopted, continues Laur, an advance would be made in agricultural terminology, and confusion would be obviated between " Betriebskapital " and the floating and fixed capitals. Thus Laur likewise does not accept the classification which includes in the working capital all the capital except that represented by the land (the natural agent) (Bodenkapital). In his view the working capital (Betriebskapital) should only comprise the total of the capitals used during one year plus the amortisation allowance for improvements, buildings, plantations, implements, machinery and live stock.

It will be seen that this distinction is of special importance where forests are in question. On an estate where an old oak wood existed, the land capital would be debited with a heavy working capital (Betriebskapital) represented by the value of the timber, while in reality no undertaking intensively endowed with capital is involved (Kapitalintensiver-Betrieb). The capital invested in improvements, buildings, plantations, implements, machinery, cattle, and the floating capital of the undertaking (Umlaufendes Betriebskapital) do not give the measure of the degree of capital endowment of a concern. The term " Betriebskapital " should therefore be used exclusively in the sense of the actual annual capital expenditure (Jahresaufwand an Kapital). In this way terminology would be brought into agreement with the idea accepted by usage, that the intensity of capital of an agricultural property increases and diminishes with the extent of this " Betriebskapital ".

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(1) For a summary of this, see *B.* Jan. 1912, No. 194. (*Ed.*).

For this reason, concludes Laur, when the capitals used in agriculture are classified according to their characteristic qualities, the term " Betriebskapital " should be abandoned and the capitals should be grouped into two classes: " Landgutskapital ", being the value of the farm, and " Pächterkapital ", the tenant's capital.

In his reply, published in the same number of the " *Fühlings Landw. Zeitung* ", Brinkmann says that he cannot accept the term " Guts- oder Landgutskapital " for the group: capital of the estate, improvements, plantations and buildings, because he denotes by this term the whole of the means of production organically united in an agricultural concern; that is to say, the estates, with their endowment of productive capital, or capital for working the undertaking (Landwirtschaftliches Betriebskapital). In Brinkmann's view, the soil can only be described as capital gained (Erwerbskapital).

The method of measuring and expressing the intensity of capital of an agricultural property, says Brinkmann, has nothing to do with the idea expressed by the term Betriebskapital. In order rationally to estimate this intensity, the consumption of capital (Kapitalverbrauch), and the charges represented by the interest (Zinsbelastung), must be taken as the basis. Only figures thus obtained will admit of measurement, because the capital fixed by its nature or purpose is used to save floating capital, a heavier burden of interest being taken in exchange.

Brinkmann discusses the question whether, for the amortisement of farm buildings, it is better to use the method of division or of compound interest, and he startes from a principle which, according to Laur, should not remain without discussion.

In Brinkmann's idea, the final object of the farmer is not the maximum net profit (Reinertrag), but the maximum of land revenue (Grundrente). Neither the one nor the other, says Laur, constitutes the final object of the farmer, whose only aim is to obtain the maximum returns; the agriculturist wishes to obtain the maximum gain from his capital and his activity, and in his view, whether this gain originates from the capital, the work supplied, or from the estate revenue, is a secondary matter. The essential difference between the organisation of a big farm, and that of small farms managed and worked by the peasant himself (Bauernbetrieb), can only be explained by the tendency to obtain the maximum gain and not the maximum land revenue. It is a well known fact that the small holder who personally works his property, can grow vines, vegetables, tobacco, etc., where a large farm would work at a loss· He does it because he sees that he has a greater profit. If, in determining the organisation of the farm, he had taken the land revenue as the basis, he would have excluded these cultivations, and would thus have made a mistake in most cases. To the farmer it matters little to know whence his gain comes, whether from the land capital, buildings capital or working capital, and in which way the profit is distributed over those capitals. He is satisfied if the final result is as high as possible, and with this object he uses his capital where it gives him the best yield.

The uniform distribution of the land revenue, in turn, is less important than the uniform distribution of the returns, and this latter is obtained better by the method of division than by that of compound interest. The principal reason which prompted Laur to declare against the method of compound interest for the amortisement of the capital invested in farm buildings is that the farmer generally is not disposed to waive interest.

Brinkmann, on his part, points out that the principle of gain could only be accepted in place of the principle of the maximum of estate profit in those cases where there was no longer any question of the object of a farming concern, but of the principle of gain itself (Erwerbsprinzip), of a person in general. With regard to this principle it may be assumed that this person, whether a working farmer or at the head of an agricultural estate, might renounce the maximum estate profit in order to use his energy and work, wholly or in part, outside the undertaking. But the question would thus go beyond the limits of the discussion. Given the fact that the person is running an agricultural estate, the principle of the maximum of estate profit is thus constituted the guiding principle of his economic conduct.

The premisses thus remaining unshaken, the deduction is in turn irrefutable: namely, that the method of compound interest is the more rational one for the amortisement of farm buildings.

As regards the inductive and deductive methods, Laur holds that they should be used as mutual checks, and he does not admit that this checking power is a privilege of the deductive method.

997 Dr. Stieger. **Present-day Problems in Agricultural Book-keeping.** (Zeitfragen der Landwirtschaftlichen Buchführung). *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Stück 53, pp. 712-717. Berlin, 30 Dezember, 1911. Stück 1, pp. 4-9. Berlin, 6 Januar, 1911.

Germany

The industrial world has created for its need a system of book-keeping that, while differing from commercial book-keeping pure and simple, constitutes a transition between the latter and agricultural book-keeping, properly so-called. Now agricultural industry differs from all others in that it deals exclusively with living organisms and their growth ; besides which the whole of the capital is invested in more or less durable means of production, whose marketable value can therefore not be reckoned on ; whilst only a very small part of the total capital is employed to obtain these products which, in the course of the agricultural year will furnish the organised means of production. That is why Thaer says on his system of agricultural bookkeeping of double entry "A commercial man must always watch fluctuations in the value of his capital, whilst an agriculturist must make it his business to find out what annual income his capital affords ". Given the essential difference between commercial and agricultural enterprise, as well as the different object of book-keeping in the two cases, it is easy to understand that the law as to personal income (Einkommensteurgesetz) should, in the case of agricultural revenue, be strictly limited to a distinction between income and source of income (Ertrag und Ertragsquelle) ; and that the German commercial code should not take agricultural or foreign industry into account at all, having adopted the term profit in reference to commercial enterprise (Gewinn) and net revenue or revenue (Reinertrag oder einfach Ertrag) in speaking of agricultural enterprise. The same distinction must of necessity be made in the matter of book-keeping, which in each case has a form and a purpose of its own.

Hence, the function of agricultural book-keeping is to determine the net profit or income ; this may be further defined as follows : the net profit on the working of any agricultural industry is given by the excess in receipts over the expenses during the working year, taxes, interest, considering the latter free from charges, and rent, besides reckoning the produce consumed or in any way utilised by the proprietor or manager of the enterprise as well as the changes, inherent in the working of it, in the initial value of the means of production themselves. The Author gives a special table of figures extracted from the books of 201 farms for the year 1909-10; these figures represent the percentage on the items forming the net profit of the exploitation, in the form of changes in the original inventory, or products supplied to the proprietor or manager of the farm. The medium, minimum and maximum figures are given:

I.

Provisions not in cash to the proprietor and increased values of the Final Inventory.

	Total produce per acre	Cash receipt per acre	% of receipt on total produce	Provision not in cash to the proprietor in % of the total produce	Decreased values and development not in cash for new buildings etc. in % of the total produce
Average	£6.3*s*	£5.10*s*	89.3	5.0	5.0
Highest figure . .	£20.7*s* 6*d*	£15.12*s*	93.9	47.5	39.5
Lowest figure .	£2.8*s*	£1.13*s*	45.8	—	—

II.

Provision not in cash supplied by the proprietor and decrease in values, of the final Inventory, as compared with the receipts and expenditures per acre of cultivated area.

Average taken from 201 farms; highest and lowest figures,

	Total expenditure and outlay per acre	Cash outlay per acre	% of the cash outlay on the total expenditure and outlay	Provision not in cash to the proprietor in % of the total expenditure and outlay	Decreased values including amortiment in % of the total expenditure and outlay	Decreased values only without amortiment
Average. . , . . .	£5. 11*s*	£4. 19*s*	89.1	1.6	9.3	4.4
Highest figure	£17.18*s*	£17.18*s*	99.0	38.0	43.2	23.9
Lowest figure . .	£2. 3*s*	£1.18*s*	55.8	—	1 0	—

So 9.3 % (or 4.4 % without amortisement) of the total working expenses and 5 % of the total production of the exploitation represent changes in the value of the inventory, against 89.1 and 89.3 % respectively of cash account, current included.

But in a great many cases, these changes of value in the inventory represent a much higher figure with a maximum of 43.2 (23.9) and 39.5 %, which makes them an important factor in the net revenue of the enterprise. The necessity is therefore evident, of a system of book-keeping taking every means of production into account.

In order to find out the annual profit on his business, a commercial man must begin by valuing his capital, and this he bases on the commercial value which the elements composing it have at the moment of balancing his accounts. But the agriculturist, for the same purpose, must only take note of the variations in value of the means of production produced by the exploitation itself, without including the influence of other factors such as, for example, the changes which have taken place in the external circumstances of the enterprise: changes which in their turn may cause new changes in the value of the means of production.

At the same time, authors are not agreed as to the method of making an inventory. The most disputed points are: amortisement, the value to be attributed to the means of production subjected to the fluctuations of market prices, and the method of valuing sums advanced for purposes of culture. The author is of opinion that in the matter of amortisement the same principle should be adopted as that followd by commerce and industry in general; if certain income-tax laws affecting agriculturists limit the ratio of amortisement to what is consumed (Substanzverbrauch) this is solely the result of technical reasons, inherent in the application of this tax. As to the value to be assigned to the means of production subjected to the variations of market prices, the principle to be followed is that of the stability of their nature; thus, medium values will be adopted in the case of groups forming an integral part of the exploitation, as a means of production; whilst those groups more specially intended for the market must be valued according to market standards

And also in the case of advances made for the various cultivations the average values must be chosen of several years exploitation, always on condition of no important changes having taken place in the methods of culture and in the rotation of crops; it will also be advisable to take these changes into consideration, by adding or deducting a differential quota, as the case may be.

At the same time it is not easy to give a sufficiently approximate estimate of the average value of such advances. The amount of labour (of both men and animals) employed in the different branches of culture sometimes varies very considerably from one year to another for reasons independent of the methods of culture adopted. These variations, as shown in a table drawn up by the Author, may even rise to 50 %, during a period of five years, in the same farm, in the case of the same species and the same methods of culture.

In the same way it is difficult, at the moment of making the inventory, to express the state of the crops under culture in figures of any practical value.

In the definition given by the author of the net profit of the enterprise, the manager's salary is already included. But he insists on the necessity of fixing the amount of this remuneration ; as also in the case of the proprietor who personally superintends the enterprise, and he further remarks that the grand Duchy of Saxe-Weimar alone has taken this item into account in fixing the personal income-tax. The author does not comprise in working expenses ground-rent and any other burthen on the property in accordance with his definition, in virtue of which the working of the farm must only be considered from a technical point of view. In other words, the farm before being worked must be considered free from these burthens.

When he comes to the discussion of the law of personal income-tax in connection with rural enterprise, the author points out certain necessary-seeming modifications of this law. What is specially wanting, he says, is a clear definition of the " regular system of book-keeping " from which the revenue is to be determined. Besides which a competent staff for the practical elaboration of the problem of agricultural book-keeping is rarely to be found.

And finally the author lays stress on the necessity of clearly defining what is meant by Vorräte (accessories of the exploitation).

The article closes with an enumeration of the most recent works on agricultural book-keeping of which the Author recommends that of Laur . " Grundlage and Methode der Bewertung der Buchhaltung und Kalkulation in der Landwirtschaft " ; the works of Ehrenberg ; a volume by von der Goltz reviewed by Seelhorst ; and a critical study by Havenstein And last of all mention is made of the periodicals which make a special point of agricultural book-keeping.

AGRICULTURAL INDUSTRIES

INDUSTRIES DEPENDING ON ANIMAL PRODUCTS.

808 GALLAGHER, F. S. **A 1911 Model Dairy.** — *The Country Gentleman*, Vol. LXXVI. No 3071, pp. 2-3. Philadelphia, December 9, 1911.

United States: New York

The Medical College for the Monroe district lays down the following properties for certified milk:

1. It must originate from healthy, and in particular non-tuberculous, cows.
2. It must contain at least 3.6 % of fats.
3. Its content of total solids must not be less than 12 %.
4. The number of bacteria must not exceed 10 000 in 1 cubic centimetre.

In order to be in a position to supply milk of this description, the owner of the " Elm Place Dairy " in the Genesee Valley (New York State) has adopted measures which might serve as a pattern for similar establishments. It should however be strongly emphasised at once that this is not a model establishment in the sense that it is not required to pay, but it is a private concern and is conducted by the owner as such, *i. e.* he must secure a suitable profit.

The dairy buildings consist of a dwellinghouse, cow shed, milk house, machinery house and barn. The cow shed has a concrete floor, is light, well ventilated and lit by gas. The ceiling is coated with white enamel paint and the walls are frequently whitewashed. The walls of the milk house are made of hollow bricks. The air enclosed in the bricks, being a bad conductor of heat, forms an effective lagging; this is of special importance for summer with a view to keeping the house cool. The machinery house contains a gas engine capable of developing 20 H.P.; a vacuum pump, a steam boiler, and in the attic a sheet-steel water tank.

In the shed 84 Dutch and Guernsey cows are housed; the periods of lactation are as far as possible arranged so that the quantity of milk produced is always abont the same. The ground litter consists of fresh shavings. The dung is cleared out of the shed three times a day. Before milking, the air of the shed is always cleared of dust by steam. In the centre of the shed a steam pipe, provided with fine perforations, is fitted; it extends along the entire shed. When steam is sent from the steam boiler in the engine room into the pipe, the whole of the stable is filled with steam in a few minutes; the steam gradually settles on the ground carrying with it dust and bacteria. Then follows the cleaning of the animals with a vacuum apparatus. From the pump mentioned above an iron pipe runs, which extends throughout the stable and is fitted at each stall with a valve. The pipe can be connected up with the vacuum brush by the valves. The brush consists of a connection piece, a collector which looks something like a big tin milk can, and a second flexible connection piece joining up to the brush. During cleaning of the cows, the whole of the dust is conveyed by means of the brush and flexible pipe into the collector; and is here retained by suitable cloth filters. The appliance enables a thorough cleaning of the animals to be effected and is very quick in operation. After the cleaning, milking begins, and it should be mentioned here that all the milk utensils and other implements which come into contact with the milk are previously sterilised by steam in a special appliance.

The milk is conveyed into the upper chamber of the milk house and from here passes through a filter made of sterile cotton and perforated copper plates, into the cooler, which is in the lower room or ground floor. The walls of the cooling room are lined with glass throughout, and to prevent bacteria reaching the milk from the air, the air which enters the room during work must pass through a cotton filter. From the cooler the milk reaches a collector which is likewise lined with glass and is of convenient capacity for receiving the yield of one milking time. The milk, cooled below 15° C., is drawn off from the collector into glass bottles, which are packed in ice and sent by motor-car to Rochester, where they are delivered direct to the consumer. The price of 12 cents (6*d*) per quart was thought rather high by many consumers, and at the outset it was by no means an easy task to find a sufficiency of buyers; now the sale is ensured.

899 LUCAS. **The Price of Milk in Paris** (Le prix du lait à Paris). DE MARCILLAC **The Cost of Transport of Milk.** (Le prix de transport du Lait). *Bulletin des Séances de la Société Nationale d'Agriculture de Fran e.* Tome LXXI, No. 9, pp. 792-806 ; 811-813. Paris, Novembre 1911.

France

The Author begins by calculating the costs of feeding a milch cow, and he takes as the standard a cow yielding 12 litres (10 ½ quarts) of milk per day. In places far from the great centres, cows are chiefly kept at grass and only receive supplementary rations in the form of concentrated foods during winter. Near the great centres of population, cows are fed with rations of a uniform kind, in most cases proportional to the quantity of milk produced. The food consumption of the grass fed cow and that of the dairy fed animal are, nevertheless, found to be equivalent.

The cost of feeding each cow is calculated as follows :

	Winter		Summer	
Meadow hay	16 ½ lb.	= 6*d*	5 ½ lb.	= 2*d*
Mangolds	55 ½ lb.	= 4*d*	—	—
Green food	—	—	74 ½ lb.	= 5*d*
Stiaw	5 ½ lb	= 1*d*	5 ½ lb.	= 1*d*
Concentrated food	4 ½ lb.	= 4*d*	4 ½ lb.	= 4*d*
Total . . .		1*s* 3*d*		1*s* 0*d*

These prices iefer to places far from centres of population; for those near to populous towns they must be increased by at least 16*s* per ton for the the green stuff, 3*s* per ton for the mangolds, and 8*s* per ton for the straw. On these conditions the food of a cow costs 1*s* 5*d* in winter and 1*s* in summer.

In the meadow region the food costs the same as the value of meadow if mown. One acre of good grass land would yield 4 tons of hay, selling at £11.2*s* 6*d* ; deducting from this sum £1,12*s*, the cost of three mowings and haymaking; 19*s* for the cost of loading and stacking ; 12*s* 6*d* for the losses caused by unfavourable seasons, etc., there remains £7.19*s* per acre. Consequently, the feeding of a cow at grass costs £. 4 per annum, or 6 ½ *d* per day. During winter the ration must be supplemented by 4 ½ lb. of oil cake, costing 4*d*, which raises the daily cost of feeding to 10 ½ *d*.

Redemption and depreciation expenses may be of two descriptions: in those parts where the cows cannot be put to the bull an average loss of £6 has been observed between the selling price of a fresh cow and that of the same animal after the lactation period; there is consequently a daily quota of 5*d*. Where there is the possibility of breeding, the feeding of the cow during the two months before calving and the keep of the bull must always be reckoned as depreciation.

Near populous centres, the costs of keep of a bull amount to 1*s* 5*d* × 365 = £26, to be divided among 40 cows, *i.e.* 14*s* per cow per annum. The food of a cow during 2 months costs £4.5*s* 6*d*, from which there must be deducted 16*s*, the value of the calf. Therefore there remains £3.9*s* 6*d*. Reckoning 300 days in milk, each day of yield of milk is encumbered with a charge of 3 ⅓*d*.

In farms farther away from populous centres, the keep of the bull falls to £17.7*s* *i.e* 8*s* 8*d* per cow ; the expense of feeding the cow decreases to £2 18*s* 8*d*, from which 16*s* for the calf must be deducted. Each milking day is consequently charged with 2*d*.

In breeding centres, the costs of keep of a cow are 6 ½ *d* per day, *i e.* £1.13*s* 4*d* for 2 months ; while the value of the calf is £1.11*s* 9*d* as soon as born

To these depreciation allowances there must be added interest on the capital invested, purchasing and renting expenses and plant renewal. The capital required for the proper working of a cow house is reckoned at £23 16*s* per head At 4 % this forms a redemption allowance of $\frac{228}{300}$ = ¾ *d* for each day of milk production.

One cowman should not have charge of more than 20 animals. A good man receives £6 per month or £2.16*s* and his keep, which makes £5.3*s* or 2*d* per day per cow.

Finally, there must be added 1*d* per cow per day for general expenses: veterinary assistance, diseases, risks during calving, carriage of milk to the main road, where it is taken up by collector, etc

Consequently, the keep of a cow costs :

	In town	On a distant farm	On grass land
In winter . . .	2*s* 2*d*	1*s* 8¼*d*	1*s* 1½*d*
In summer . .	1*s* 9*d*	1*s* 5½*d*	10 ½ *d*

Estimating the daily production at 9 quarts of milk with the breeder and 10 ½ quarts with the farmer, the costs of production of milk per gallon are found to be

	Near towns pence	On a distant farm pence	On grass land pence
In winter	9 ¾	7 ¾	6
In summer . . .	7 ¾	6 ½	4 ¾

One gallon of milk fetches 4*d* to 4 ¾ *d* in grazing regions, 5 ½*d* to 6 ½*d* on farms distant from populous centres, 8 ½*d* in town. The cost of collection, carriage and distribution in Paris, ranges from 3 ½*d* to 7*d* per gallon, according to the distance from the centre of production.

These expenses are estimated as follows: a collecting centre can collect 200 milk cans per day, at a cost of 8*d* per can; a milk distributing depot in Paris involves an expense of £21 per day, which represents an expense of 5*d* on each of the one thousand cans distributed every day. The costs of railway carriage are 14*s* 2*d* per ton per 100 miles, plus 1*s* 2*d* per ton. As each can weighs 60 lb., the carriage of one ton corresponds to 37 cans.

Finally, there must be added to the expenses losses in the shape of evaporation of the milk during sterilisation (3 %), spoiling, etc.

The collection and distribution of milk therefore require the following expenses per can of 20 litres (4 ½ gallons):

Collecting	8*d*
Distributing	5*d*
Losses of milk	1*d*
Carriage	2*d* to 11½*d*
Total	1*s* 4*d* to 2*s* 1½*d*

These charges must be regarded as the minimum because they refer to a normal year and a well established business.

The expenses involved in the upkeep of a milk retailing depot in Paris may be estimated on the average at 24*s* per day. As the average depot sells 65 gallons of milk per day, the costs of retail sale of one gallon amount to 4 ½*d*.

In conclusion, one gallon of milk costs from 9 ½*d* to 6 ¾ *d* for production; 3 ½*d* to 6 ¼*d* for expenses of transport, and 4 ½*d* to 5*d* for distribution expenses. The milk conveyed to the door of the consumer therefore represents a cost of 1*s* 5 ½*d* per gallon without allowing for the legitimate profit of the breeders, collectors and dairymen. That explains why on the one hand the companies monopolising the milk business refuse to pay a higher price for it, and why on the other hand breeders refuse to engage in the production of milk.

In London where there is no campetition between powerful companies, milk fetches 4 ½*d* a gallon more than in Paris; the same is the case in Berlin, where the distribution of milk from door to door costs far less than in London and Paris.

M. de Marcillac points out that several provincial towns, particularly industrial towns, cannot find milk in the immediate environs, while it is produced in large quantities by a number of small breeders within a radius of twenty miles. The cost of carriage of 9 gallons of milk (100 lb. with the can) by railway for a distance of 16 miles would, on the Orleans line, for instance, be sixpence; but to this expense a registration and stamp duty of fourpence halfpenny must be added and eightpence for the return of the empty cans, which although conveyed free of charge by the railway company, are nevertheless subject to the fiscal tax. The State therefore levies 1 ¼*d* per gallon of milk, that is to say 200 % on the cost of transport and 15 % on the real value of a primary article of food.

The Author suggests a reduction of the duties on forwardings of agricultural produce, and particularly on milk, when sent in quantities not exceeding 220 lb. and for small distances.

DOANE, C. F. **Methods and Results of Paraffining Cheese.** *U S. Dep. of Agr., Bureau of Animal Industry, Circular 181*, pp. 1-16. Washington, November 1911. **400**

United States.

The practice of paraffining cheese is of comparatively recent date. Nevertheless at the present time nearly all cheese of the Cheddar type made in the United States is paraffined at some stage before it reaches the consumer. In this paper the writer reports experiments indicating the methods and conditions under which the best results have been obtained.

The conclusions are summarised as follows Paraffining is an effective method of preventing losses in weight of cheese due to evaporation and of preventing the growth of mold.

All temperatures of the melted paraffin of 220° F. (104° C.) and above are satisfactory for doing this work, and the experiments showed that the length of time (from 1 to 10 seconds) the cheese was immersed at these temperatures was immaterial. A temperature of 190° F. (88° C.) secured in a hot-water bath outfit was not satisfactory, but where it is used the cheese should be immersed for at least 5 seconds.

Paraffining at three days from the press gave the best results. The amount of paraffin adhering to the cheese varied with different temperatures of the paraffin and the length of time the cheese was immersed.

The cheese after paraffining should not be allowed to remain in a warm curing room for more than one day.

401 BOEKHOUT, F. W. J. and OTT DE VRIES, J. J. **The Action of Pathological Milk on the Manufacture of Cheese.** (Ueber den Einfluss pathologischer Milch auf die Kasefabrication). — *Centralblatt für Bakteriologie, Parasitenkunde und Infectionskrankheiten,* 31. Bd. No. 23-25, pp. 569-567. Jena, 30. November 1911.

Holland

At the experimental Station of Hoorn in Holland, the authors carried out trials in connection with the influence of the use of defective milk on cheese manufacture. They had at first one and afterwards four cows with diseased udders at their disposal. The milk of the several udder quarters of each cow was subjected to the Trommsdorff leucocyte test, and one, two or even three quarters of one cow were found diseased. The contents of catalase in the milk from the diseased quarters, also ascertained, were high: 10 cubic cm. of milk and 5 cubic cm. of peroxide of hydrogen in 22 seconds at room temperature produced from 5 to 16 cubic cm. of oxygen. A bacteriological examination showed the presence of streptococci. *Bacterium coli* was not found in any instance; therefore the cows were suffering from strepto-mastitis.

The milk of the first cow (2 ½ kg., 5.5 lb.) was now mixed with 22 ½ kg. (49 ½ lb.) of other milk, and from it, on 16 different days from the 8th June to the 9th July 1910, one Edam cheese was made in the ordinary way. The milk yield of the four other cows, 43-45 kg. (94.6 to 99 lb) daily, was mixed with 27-25 kg. (59.4 to 55 lb.) of other milk, and with the 70 kg. (154 lb.) of milk thus obtained, 3 Edam cheeses were made daily from the 1st to the 7th September 1911. Only in one single instance was a cheese observed to be distended by gas; some others showed cracks; a few had a somewhat "short" curd, but otherwise the product was normal and no injurious effect of the defective milk was observable.

Although from the technical point of view there is no objection to the use of the milk of cows suffering from mastitis, the authors regard it as undesirable from the hygienic standpoint. In their investigations they became aware that in order to ascertain the presence of an abnormal quantity of leucocytes, and likewise for the catalase test, it is not always sufficient to examine the milk of the whole of the udders mixed together, but the milk of each quarter requires separate examination. Hence they are of opinion that the standard laid down by Trommsdorff, according to which only figures over 1 are suspicious in leucocyte tests, is too high, and that when examining the milk of different quarters the limit should be reduced to 0.55.

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Henneberg, Dr. Should Dry or Liquid Joghurt Preparations be Used? (Trockene od. flüssige Yoghurt Präparate). — *Tageszeitung für Brauerei.* X. Jahrgang. Nr. 297, p. 1751. Berlin, 19 Dezember 1911.

According to many communications received by the author, the use of dry Joghurt preparations was attended by failure in the production of Joghurt curd.

Germany

Dr. Henneberg has now, in the Institute for Fermentative Industries in Berlin, examined seven different dry preparations purchased at a chemist's, and inoculated first ordinary and afterwards sterilised milk with them. In not a single case were viable Joghurt bacilli found. The use of such preparations, therefore, as frequently bought of chemists, is subject to the risk of their being worthless. Consequently only liquid cultures from approved sources of supply should be employed.

INDUSTRIES DEPENDING ON PLANT PRODUCTS

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The Last Sugar Season in Germany. (Zuckergewinnung u. besteuerung im deutschen Zollgebiet, während des Betriebsjahres 1. Sept. 1910 bis 31. August 1911). — *Die Deutsche Zuckerindustrie,* XXXVI, Nr. 50, Besondere Beilage, pp. 935-948. Berlin, 15. Dez. 1911.

Germany

It is very interesting to compare the principal results of the 1910-11 sugar season in Germany with those of the 1901-1902 season.

Season	Sugar factories at work	Acres under cultivation	Crop cwt per acre	Beets treated tons	Crude sugar produced tons	Yield %	Molasses produced tons	Consumption of sugar per head of population lb
1910-1911	354	1 190 435	2 63	15 500 147	2 548 949	15.96	461 904	46.66
1901-1902	395	1 182 510	66	15 759 863	2 265 871	13.63	477 023	28.59

It must be remarked that the sugar yield was only exceeded by the 1908-1909 season, when it attained 16.77 %, while the total production was the largest ever recorded hitherto. Out of the total production of beet, 5.96 % was harvested by the sugar factories direct and 41.14 % by the members of agricultural co-operative societies, who own the greater part of the sugar factories; the remaining 52.90 % was harvested in a different way and sold; this position of things has remained almost unchanged since 1901-1902, except for a slight increase in the beet harvested by co-operative societies.

As regards industrial utilisation, there is still the tendency to restrict as far as possible the residues to be treated for secondary products because this considerably increases the cost of production. Every year new processes are tried for this purpose. In this way the positive results obtained by putting into circulation afresh a part of the residues of the " firsts " the production of which is increased, are confirmed, while the depreciation of the " thirds " is eliminated ; this practice has therefore become widely adopted, because it has the additional advantage of preventing a prolonged season, which means an appreciable saving in labour. The Steffen process is also said to have yielded good results, partly at least, and in 1910-1911 it was introduced into other sugar factories. The Hyross-Rack continuous diffusion process is said to have been applied also in a second sugar factory. Finally, there is a new process, the Bosse process of scalding and pressing.

The extraction of sugar from molasses in sugar mills has become less important. The molasses are handed on to special establishments for the extraction of the sugar, or to the distilleries, or else they are used for the preparation of concentrated cattle food, etc. The establishments for the extraction of sugar from molasses — which have not increased in numbers – all work with the Strontian process, and prepare edible sugar.

The yield, or proportion of refined sugar yielded by the crude sugar, was calculated, for the season, at 88 to 90.4 % for the firsts, and 72 to 90.3 % for the seconds.

Lastly, as to the residues of sugar factories, which are of such importance to agriculture, we in the first place find the ordinary beet slices which are supplied free of charge to the purveyors of beets, generally in the proportion of 40 to 50 % ; the rest is used for the animals in the sugar factory, or given to the members of the co-operative societies, or finally, sold at the price of fr. 0.47 to 1.06 per quintal (2 $^{1}/_{4}$ *d* to 5 $^{1}/_{10}$ *d* per cwt). As regards the drying of the beet slices with a yield of 1 quintal of dried slices per 9 quintals of fresh, the difficulty of relatively high costs of plant and up-keep is encountered. The product is sold at the rate of fr. 10 to 15 per quintal (4*s* to 6*s* per cwt). On farming properties new drying plants for beetroot leaves have been introduced.

The scum from the clarifying processes which is especially suitable as a lime manure, was sold at fr. 0.17 to 1.05 (0.8*d* to 5*d* per cwt) per quintal; with regard to the soil from the washing of the beets, it is chiefly adapted for soils inappropriate for beet and for grass lands, because on beet fields it may promote the growth of parasites; this washed soil is sold at the rate of 1 to 6 centimes per quintal (0.048*d* to 0.29*d*). These two products are also supplied free of charge to the society members.

The molasses are not only used for the extraction of sugar and for distilling; they are also employed in small quantities in yeast, blacking, soap and chicory factories, for the preparation of soda and potash, and as a plastic material for colouring extracts and founders' moulds. Latterly their use as a cattle food has likewise grown; they are sometimes diluted and sometimes mixed with other forage for immediate use; again they are used for the preparation of concentrated cattle food with copra, cocoanut, colza, rice and maize cakes, brewers' draff, earthnut shells, bran, etc. They are also mixed and dried with the beetroot slices or else mixed with peat owing to its remarkable power of absorption, although it is not nourishing. The prices have not varied much since the previous year; they fluctuated between fr. 5.67 and 13 per quintal (2*s* 3.4*d* to 5*s* 2.7*d* per cwt).

In conclusion it should be noted that the price of sugar (Magdeburg) has fallen off in comparison with the previous year, owing to the great output in almost all centres in Europe; nevertheless lately a rise took place, due to the unfavourable forecasts for the season now in progress; these forecasts are based on the heat and prolonged drought of the last summer, which caused damage in the majority of the beet-producing centres in Germany.

MURGEON, L. **On the Use of Moist Bagasse in Cane Sugar Factories.** *The International Sugar Journal*, Vol. 13, No. 156, pp. 658-661. Altrincham, Manch., December, 1911. **404**

France. England

Wood fuel, as bagasse, containing more or less moisture is frequently used in cane sugar factories, distilleries, and other works. Notwithstanding its moisture, such fuel may be burnt under boilers provided with suitable grates. But in any case it would be of very great advantage to dry the fuel partially before use, on condition that this desiccation is not two costly. In order to see if such desiccation is realizable in practice, the writer calculates the economy obtainable.

As practical conclusion, the writer applies his calculations to bagasse, although they apply equally well to other forms of wood fuel. The bagasse from 400-500 metric tons of cane treated in 24 hours represents 90 tons with 50 per cent. of water. In burning this the same evaporation as in burning 56.80 tons of bagasse containing 30 per cent. of water will be obtained. On the contrary, in drying the 90 tons of bagasse, 64.25 tons of bagasse containing 30 per cent. of water will be obtained. Hence the economy effected by drying will be represented by the value of 7.45 tons of bagasse containing 30 per cent. of water. Now this quantity is practically equivalent to 6.825 tons of wood, air-dried. Taking wood at 15 fr. (12*s*) per ton at the factory, the economy realized by drying is therefore 102.40 fr. (£4 3*s*), in 15 days 15 360 fr. (£609 10*s*). In order that this economy should be obtained, it is necessary that the desiccation should be free of expense, by utilizing the lost heat and waste steam. It appears that this condition is fulfilled in the patent system of Alph. Huillard (Suresnes near Paris) which has been employed for a number of years in different factories. The saving in cost enables cane sugar factories to recuperate the cost of installation in 3 campaigns of 150 days.

To enable those interested to take account of the economy realizable by drying the fuel to 30 per cent. of water before its use, the following practical formula may be given:

Daily economy in fr. (25.25 fr. = £1).

$$= P\left(\frac{100-n}{100-30} - \frac{345\,000 - 4094 \times n}{345\,000 - 4094 \times 30}\right)\frac{7\,200}{2.705} \times \frac{1}{C} \times \frac{q}{1000}$$

in which P = the weight of moist fuel, in kg., dried per day; n = the percentage of moisture in this fuel; C = the calorific value of the extra fuel employed in the factory; and q = the price in fr per ton of this extra fuel.

405 PIOTTI, A. (Italian Delegate for the Wine trade in Berlin). **The Use of Blended Wines in Germany in 1910 and 1911.** (L'impiego dei vini da taglio in Germania nel 1910 e nel 1911). — *Boll. del Ministero di Agric. Ind. e Comm.* Anno X, Vol. II, Serie B, Fasc. 10, pp. 375-346. Roma, 15 Nov. 1911.

Germany. During the last few years, the importation of red wines for blending into Germany has diminished constantly, as displayed by the following table.

In	1906	red wine imported	138 784	quintals,	3 053 248	gals
»	1907	» » »	94 872	»	2 087 184	»
»	1908	» » »	89 666	»	1 972 652	»
»	1909	» » »	85 514	»	1 881 308	»
»	1910	» » »	79 086	»	1 739 892	»

During the first half year of 1911 there were imported 28 200 quintals (620 400 gals) as against 46 284 quintals (1 018 248 gals) during the corresponding period of 1910. The insufficiency of native wines for blending and the high prices of these wines and of foreign wines for this purpose were all reasons which combined to render wine blending far less profitable than the direct importation of table wine. On the other hand, the obligation laid down by the law, of declaring, when selling blended wine, whether it is obtained by mixing with a white wine, led to a notable diminution in the extent of these blends to the exclusive advantage of red wine mixing. Even Alsace-Lorraine, which a few years ago used up in this way a great part of its white wine, confined itself to mixing 5 398 hectolitres (118 756 gals) in 1910.

During the last two years Germany used the following quantities of foreign wines for blending:

Origin	1910		1909	
	hl	gals	hl.	gals
Spain	39 628	872 173	47 830	1 052 690
Italy	11 650	256 405	7 804	171 758
Greece	9 088	200 018	4 058	89 313
France and Algeria	4 934	108 592	16 330	359 407
Portugal	2 226	48 992	—	—
Austria-Hungary .	516	11 357	337	7 417
Turkey	505	11 115	736	16 190
TOTAL :	68 547	1 508 652	77 095	1 696 784

LAGLANDE. **Turning of Wine, how Characterised.** (La caractérisation de la piqûre des Vins.) — *Le Moniteur Vinicole*, 56e Année, No. 99, pp. 393-394 Paris, 22 Décembre 1911. **408**

France

Mycoderma aceti, when it develops in wines, gives rise to volatile acids, which render the liquid unsuitable for consumption. The liquid is then said to be " turned ". But the presence of volatile acids does not prove that the wine is soured or tends to become so, because a normal wine may, especially in hot countries, contain up to 1.40 gr. of volatile acid per litre (1.4 per 1 000), calculated as sulphuric acid, without possessing the flavour and smell of soured wines. There is in fact no absolute correlation between the contents of volatile acid and turning sour.

A wine containing *Mycoderma aceti* is subjected to a gradual increase in its volatile acidity.

To determine the presence of *Mycoderma*, recourse may be had to microscopic examination. For this purpose however the ferment must be present in abundance.

If it is not abundant the wine may, as suggested by Dr. Blarez, be exposed to heat in a stove at 30° C, in a thin layer contained in a flat vessel. Unless the wine has been pasteurised at a sufficient temperature, its volatile acidity may in the course of two or three days attain 2, 3 and 4 grammes per litre (2 to 4 per 1 000). If the wine is free from ferment the volatile acidity found at the outset is not noticeably modified.

407 MATHIEU, L. **Aeration and Mouldy Taste in Wines.** (Aération et goûts de moisi des Vins). — *Bulletin agricole et viticole de la Charente.* 14e année, No. 157, pp. 165-166. Angoulême, 30 Novembre 1911.

France

The tasting of new wines as early as the month following racking off into casks, sometimes brings to light the existence of foreign tastes, such as a taste of mould or a "stagnant" taste ("croupi").

The mouldiness is produced by moulds living on the wooden vessels used in the handling of the wines. These moulds contain an odorous principle which is imparted to the wood, whence it spreads throughout the wine itself, even if the vessels have been disinfected with steam or sulphuric acid.

The stagnant taste is due to wood which has contained water infested by different micro-organisms, and is propagated in the wine in the same way as the mouldy taste.

A cause of the very rapid growth of these tastes is oxidation by the air. For this reason all operations which involve aeration such for instance as racking with exposure to the air, should be avoided; wines, when having abnormal tastes, should be racked by pumps, syphons. etc., the discharge nozzle being carried to the bottom of the vessel filled, and the formation of froth avoided, the latter being a sign of a thorough stirring up of air and wine. The casks to be filled may also be fumigated with sulphur or alcohol to absorb the oxygen they contain.

During transit abnormal tastes also develop in wines, owing to the shaking and aeration.

These tastes may be toned down so as to be almost imperceptible to the palate, but there always remains a small quantity of abnormal-tasting substances which may be made perceptible by abundant aeration. The method of mitigation is based on the property possessed by fatty substances, vegetable oils or vaseline oils, of dissolving the mould oil, which produces the abnormal taste, better than does wine. The wine, stirred up with olive oil, vaseline oil, or better still one of these oils emulsioned, yields up to the oil the greater part of the odorous substances. Oil emulsions may advantageously be replaced by mustard powder, previously passed through boiling water to prevent the production of essence of mustard on contact with the wine.

The wine is stirred up four or five times a day to suspend the emulsified oil or the mustard powder, and is afterwards allowed to rest for 24 hours and racked off covered from the air, being afterwards fined.

This treatment takes away something of the flavour of the wine, the substances imparting the *bouquet* being highly soluble in oils.

VERBIÈSE, M. F. **The Treatment of Grain in Agricultural Distilleries.** (Le travail des grains dans les distilleries agricoles) — *Bulletin de l'Association des chimistes de sucrerie et de distillerie de France et des Colonies*, 29e année. T. XXIX, No 6, pp. 376-379. Paris, Décembre 1911. **408**

France

The quantity of alcohol produced this year is very low. This is due to the considerable shortage in the beet crop, the small quantity of molasses produced in sugar factories — part of which is used for the manufacture of molasses cattle fodder — and lastly the deficiency in the quantity of wines for the distillery.

Some manufacturers are endeavouring to revert, for the production of alcohol, to raw materials such as Algerian figs, Sorghum, Carobs, etc., from which a remunerative product may be obtained owing to the high prices of alcohol.

Farms which are equipped with plant for distilling beet could very economically produce grain alcohol while using the draff as forage.

For this purpose a method of manufacture would have to be found not requiring a plant differing greatly from that used for beets, and by which, from maize for instance, 35 litres (7.7 gals) of alcohol rectified to 90° might be obtained from 100 kg. (220 lb.) of grain.

For the purposes of this small industry the process of saccharifying by malt and by mucedineae must be abandoned, because both require extensive plant. There remains the old process by means of an acid, which, if it does not give high yields, is at any rate very cheap. As practised hitherto, it requires the use of a special distilling column, because the wort of grain saccharified by means of an acid chokes up the plates of an ordinary beet juice column. The author has tried the process by subjecting whole grains of maize to diffusion in acidulated water. He was able to utilise almost the whole of the beet distilling plant, including the distilling column, and to obtain satisfactory yields corresponding to complete exhaustion of the starch from the draff.

If we consider a small farm distillery not connected with a railway or canal, maize costing at the present time 21 fr. per 100 kg. (8*s* 5*d* per cwt.) delivered to the distillery, the price of the raw material required for the manufacture of one hectolitre of 90° alcohol is 60 francs (2*s*. 2*d*. per gal.). The same quantity of maize produces about 215 kg. (473 lb.) of drained and pressed draff of an average value of 7 francs (5*s* 6 ½*d*). The draff, in a small works turning out 20 hectolitres (440 gals) of alcohol per 24 hours, will suffice to cover the cost of manufacture.

400 CETTOLINI, SANTE. **The Present Conditions of the Distilling Industry in Italy.** (Le attuali condizioni dell'industria della distillazione in Italia). — *Bollettino quindicinale della Società degli Agricoltori italiani.* Anno XVI, No. 24 pp. 949-954. Roma, 31 Dicembre 1911.

Italy

In 1896-97 there were 24 distilleries of the first class, principally utilising raw materials other than wine; out of these 24, only 17 were at work, producing 123 746.44 hectolitres (2 722 422 gals.) of absolute alcohol in the year; in 1904-05 the number of these factories fell to 22, of which only 21 were at work, producing 163 659.58 hectolitres (3 600 511 gals.) of absolute alcohol; in 1909-10, there were 24 distilleries, with only 16 in operation, working 19 stills with an output of 129 896.35 hectolitres (2 857 720 gals.); finally in 1910-11 the number of distilleries amounted to 35, of which 34 were at work, operating 56 distilling appliances which produced 232 054.45 hectolitres (5 105 198 gals.) of absolute alcohol. In 1911 the distilleries were distributed as follows: 13 in Northern Italy; 13, of which 11 only were at work, in Central Italy; 8 in Southern Italy, and 1 in Sicily. In Sardinia, the distillation of wine and wine lees is subject to no restriction.

The distilleries of the first class particularly distil cereals and other starchy products, sugar and beet refinery waste (Venice and Ferrara) and some raisins (Naples, Pozzuoli) coming from abroad. The following table gives the figures of this branch of manufacture for 1910-11 :

Raw materials	Raw materials treated		Absolute alcohol produced	
	quintals	cwt.	hectol.	gals.
Cereals and other starchy produce	36 457	71 762	12 527	275 586
Sugar factory residues	395 043	777 603	106 672	2 346 789
Beet and Jerusalem artichokes .	127 858	251 676	8 554	188 193
Raisins	6 482	12 759	1 948	42 856
Other substances (yeast and molasses water)	1 372	2 701	194	4 275

The average yield of absolute alcohol was as follows : maize, 31 to 32 % (maximum 37.08 %, minimum 11.60 %, according to condition of preservation) ; molasses, about 25 % (maximum 30 % minimum 18 %); beet, 6.70 % (distillery of Cavarzere, Venice), 8.24 % (distillery of Ferrara), 7.60 % (distillery of Torchiarolo, Lucca) ; raisin, 12.76 %; yeast water 2.93 %.

The division according to provinces of the output of alcohol in 1910-11, was as follows:

Province	Hectanhydres	Gallons of absolute alchohol
Ancona	1 386.76	30 508.72
Aquila	5 401.98	118 843.56
Caserta	4 657.93	102 474.46
Catania.	505.20	11 114.40
Ferrara.	84 448.31	1 857 862.82
Genoa	31 982.94	703 624.68
Lecce	590.81	12 997.82
Leghorn	4 530.36	99 667.92
Milan	285.29	6 276.38
Naples	17 678.37	388 924.14
Padua	23 475.18	516 453.96
Perugia	305.05	6 711.10
Rome	208.15	4 579.30
Rovigo	20 700.57	455 412.54
Turin	8 897.72	195 749.84
Treviso	5 265.31	115 836.82
Venice	14 874.52	327 239.44

410 NEUMANNN, M. P. and KNISCHEWSKY, O. **Stringy Bread.** (Über das Fadenziehen des Brotes). — *Zeitschrift für das gesamte Getreidewesen.* No. 11-12, p. 242. Berlin 1911.

Germany

The degeneration which results in the quality of "stringiness" in bread is due to the decomposition of the elements of the bread, produced by certain special bacteria.

There are a large number of bacteria capable of producing this alteration, but they all require the same conditions for development, so that their classification is practically of secondary importance. Nevertheless, they may be included in the group of hay bacilli. Flour is an excellent means for their diffusion, and all flours contain them. These bacteria do not always lead to the degeneration of the bread in question, but this is merely due to the fact that the conditions imperative for their normal development are not realised when a rational method of bread-making is used.

It has been noted that among the raw materials used in bread making, rice and potato flours are most infested by the hay bacteria; their rapid growth also seems due to the great facility with which flours form a paste with water. In hot years especially, when this alteration of bread is observed, the flours mentioned must be discarded. The best temperature for the development of the bacteria is 40° C. When the disease has appeared, however, it continues even at much lower temperatures. The high temperature required by their growth is the reason why this degeneration is chiefly manifested in summer. Therefore the bread must be rapidly cooled after baking, to prevent it getting stringy; for this purpose a cool, well aired room will be exceedingly useful. Infection may occur with all flours, both fine and ordinary wheat and rye flours. It should especially be noted that the storage of flour in damp, hot places promotes stringiness in the bread.

It should likewise not be forgotten that an excessive quantity of water in kneading is also a favourable factor to the development of the disease, as is also difficult fermentation of the mass. A sufficient quantity of pure yeast is especially necessary to prevent the growth of the bacteria. Sugars and malt preparations stimulating fermentation likewise impede the growth of the bacteria. Among all the means of preventing the disease, however, the best is the use of soured dough in bread making, because it has been found that the degeneration takes place almost exclusively in those places where the taste of the public is against the use of this method of bread manufacture.

IMBERT, J. Sterilisation and Drying of Figs, Imbert Process. Stérilisation et séchage des Figues. Procédé Imbert. — *Bulletin mensuel de la Société centrale d'Agriculture, d'Horticulture et d'Acclimatation de Nice et des Alpes Maritimes*. No. 12, pp. 396-397. Nice, Décembre 1911. 411

France

Spread the figs on hurdles and subject them to the action of sulphur dioxide in a stove or an air-tight box, during the whole night. Next day take them out of the stove and expose the hurdles to the sun. In the evening, turn the figs, stack the hurdles and place them beyond the reach of damp. Carry out this operation for 5 or 6 days until the figs are sufficiently dried. Then pile them in a bag hung up in a room with a regular temperature of 25 to 30° C. In 4 or 5 days there is a start of fermentation. Then spread the figs in the open sun on a large rug, take them in at night and spread them out again on the following day, taking care to turn and mix them from time to time. Generally, this last exposure to air and sunlight only lasts 2 days. Then put the figs in a box, being careful to press them thoroughly, and close the boxes so that they are air-tight. At the end of a month, put the figs into small boxes; this is the moment when sorting and flattening is carried out. If these boxes are hermetically closed the figs thus prepared are never contaminated.

These figs are only edible at the end of 2 or 3 months but they keep from one year to another and even longer. They become whitish, floury and very sweet. Some varieties grow transparent.

Pre-Cooling of Fruit. — *The Producers' Review*, Vol. VI, No. 8, p 354. Perth, November 20, 1911. 412

Australia

At the 1910 Australasian Fruit Conference, held at Hobart, several growers being present from Victoria and South Australia where they had experience of pre-cooling, the West Australian representatives proposed the following resolution, which was carried unanimously. The resolution speaks for itself:

« That pre-cooling of fruit for export is neither necessary nor advisable, because:

1. It would necessitate the fruit being gathered a week earlier than the present system.

2. The extra handling involved in pre-cooling considerably damages the fruit.

3. That Western Australian experience has proved conclusively that pre-cooled fruit has no advantage whatever over fruit not pre-cooled.

4. That the shipping companies are already paid for cooling the fruit.

5. That if pre-cooling is necessary for fruit before loading into chilled holds, then it logically follows that fruit before being stored in ordinary cold stores should be pre-cooled, which reduces the position to an absurdity.

6. That, apart from other considerations, no expense should be added to the cost of export unless extra profit would be won thereby.

PLANT DISEASES.

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

Appointment of a Commission for Combating Plant Diseases in Italy, (Regio decreto del 29 ottobre 1911, No. 1208 col quale viene istituita una Commissione per la difesa contro le malattie delle piante). — *Bollettino del Ministero di Agricoltura, Industria e Commercio.* Anno X, Vol. II, Serie *A*, fasc. 24, pp. 685-686. Roma, 9 Dicembre 1911. **418**

Italy

In view of the necessity of giving a coordinate direction to the study of plant diseases and their prevention, and also of facilitating and expediting the operation of the Technical Consultation Services in the Ministry of Agriculture, the following enactments have been laid down by the Royal Decree of the 29th October 1911, No. 1208 :

" Article I. In the Ministry of Agriculture, Industry and Commerce a Consultative Committee has been appointed for combating plant diseases. This Commission is likewise invested with all the functions at present incumbent upon the Phylloxera Consultative Commission, the Commission for investigating the amendments to be proposed in the law of the 24th March 1904 against *Diaspis pentagona*, and also the functions of the Consultative Committee for Olive growing and Oil production in regard to Olive tree diseases.

" Article II. The Commission shall consist of fifteen members, fourteen of them to be appointed by Royal Decree on the proposal of the Ministry of Agriculture, Industry and Commerce, and the Director General of Agriculture, for a term of three years.

" The Commission shall hold an ordinary session at least once a year, and an extraordinary session whenever the Ministry thinks needful.

" The Commission shall be presided over by the Minister, and in his absence, the Assistant Secretary of State. Failing the Minister and the Assistant Secretary of State, the presidency devolves on a deputy appointed by the Ministry at the beginning of each session.

" The office of Secretary shall be fulfilled by an officer of the Ministry selected by the Minister.

" The General Director of Agriculture may, with the authorisation of the Minister, sanction the presence at the meetings of the Commission, of the Officers of the Central or Provincial Administration, provided they deal with specified subjects. . . . .

" The Minister may also sanction the presence of persons possessing special competency or representing regions interested . . .

" Article III. . . . . .

" Article IV. . . . . .

" Article V. . . . . .

" Article VI. . . . . .

" Article VII. The coming into operation of the present decree shall abrogate the Phylloxera Consultative Commission, the Oil and Olive growing Consultative Commission and the Commission for the Study of Amendments to be proposed in the law of the 24th March 1904 against *Diaspis pentagona*.

" A special decree shall set forth rules concerning those functions of the Consultative Commission for Oil and Olive cultivation which are not handed over to the Consultative Commission for combating plant diseases ".

STATIONS FOR PLANT PATHOLOGY AND AGRICULTURAL ENTOMOLOGY.

414 BERLESE, ANTONIO (Director). **The Work of the Royal Station of Agricultural Entomology of Florence, in 1909, 1910 and 1911.** (L'attività della R. Stazione di Entomologia agraria di Firenze, nel triennio 1909-1911). — *Redia*, Vol. VIII, fasc. 2°, pp. 3-20. Firenze, 1911.

⁂

Italy

In 1909, 1910 and 1911, just as previously, the Royal Station divided its operations over laboratory work (taking the form of permanently gratuitous service to the public), and field work.

As and when needed, it distributed more than fifteen thousand printed leaflets concerning the most common insect pests and the means for their control.

Simultaneously with studies and experiments against the Olive Tree Fly (*Dacus Oleae*) in the Maremma of Tuscany and in Apulia, Professor Berlese, the director of the Station, seconded by his assistant, continued and completed the investigations entered upon against *Diaspis pentagona*. He also systematised throughout Northern and Central Italy the spread of the natural enemy of this scale insect, *Prospaltella Berlesei*, which had already been multiplied with the utmost success in the first centres of cultivation of the mulberry in Lombardy, Venetia and Piedmont, where, in 1911, about eight thousand pieces of mulberry branch bearing infected *Diaspis* were distributed.

At the same time, Professor Del Guercio, assistant-director, successfully directed the investigations in relation to *Phloeotribus scarabaeoides* and *P. Oleae* of the olive, which is the cause of enormous damage and the impoverishment of a great portion of Liguria. In addition, Professor Del Guercio studied a new and very formidable enemy of the olive tree, *Diaspis ostreaeformis* (already an apple tree pest), and also some new Cecidomyiidae which damaged the inflorescences, the leaves and the tender twigs of the olive tree. He further made observations as to the feeding habits of the larvae of the Cebrionides and the Elateridae, on *Chrysomphalus minor* Berl., a scale insect introduced recently into Italy, where it attacks citrus trees and a number of other plants. Professor Del Guercio has likewise entered upon the first observations in connection with the destruction of the larvae of *Vesperus luridus* Rossi and *V. Xatarti* Duf., which damage the roots of the olive tree, and has conducted researches into the Eriophyidae, which attack the hazel and pear tree.

As regards insecticidal formulae, mention must be made of the aqueous solution of molasses with arsenite of potash, proposed by Professor Berlese against the Olive Fly and the *Ceratitis capitata* of citrus trees. There must now be recorded, a solution of molasses and arsenite of potash in sea water; the latter is no longer used for brush applications; it is put in plates, saucepans or any other vessels, which are distributed through the olive grove, in citrus plantations, etc. This solution is also proposed by Professor Berlese.

Attention should also be directed to the polysulphide and nicotine formulae proposed by Prof. Del Guercio against *Phloeotribus Oleae*; polysulphides, with or without tarry substances, for the de struction of the Eriophyidae and scale insects; and recipes with xylenols, etc., directed against the larvae of *Vesperus* and the underground Aphidians.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

416 PERRIRAZ, J. **Effect of the Drought of the Summer of 1911 on Certain Plants in Switzerland.** (Influence de la sécheresse de l'été 1911 sur quelques plantes, en Suisse). — *Extract des Procès-Verbaux des séances de la Société Vaudoise des Sciences Naturelles.* Séance du 15 Novembre, 1911, Lausanne

Switzerland.

" The prolonged drought of the summer of 1911 has had a marked influence on certain species of plants We will first mention the effect produced on the leaves.

" Some of the avenues in Vevey and the neighbourhood are planted with silver limes; the leaves of these trees suffered from the continuuos heat of July, so that the extremity of the mid-rib dried up; and when, with the autumn rains, the sap recovered its normal course, two secondary ribs were formed, having the same importance as the central; and thus the leaf became bifid.

" Along the embankment of the Veveyse and in the square in front of the town-Hall are some *Pavia rubra* trees that generally flower twice; il happened again this year, but one of them produced even a third crop, quite well-marked, though not abundant. And again, we may mention a Lilac which blossomed twice bearing a very large number of flowers.

But the most interesting case is that of some Chrysanthemums of the Tokio variety (noticed in the garden of Mr. Crot, horticulturist); a meagre amount of sap had traversed their tough stem with its inelastic cells. But when the rains came, the force of the current (of sap) was so strong as to burst the stems in several places. The different parts of the flower were consequently very unequally nourished and varied very greatly in appearance. In some cases only half of the flower head had developed, the organs of the other part being atrophied or deformed; in other cases it was possible. from the difference in the length or general development of the flower, to trace the exact moments when the stems were broken. Frequently, too, the central yellow flowers appeared in varying numbers, thus returning to the simplest type of inflorescence. Numerous alterations were seen in the venation, or arrangement of the fibro-vascular tissues, new bundles being visible in the parenchyma, outside the usual ones. Instead of being normal in form, many were completely closed as in the case of acotyledons; and besides, the walls of the cells were thicker and less refractive.

The genus *Apium* includes several species which grow in damp and sandy places. By repeated improvement a number of varieties of celery more or less large and resistant, and with edible flesh, have been obtained. The 1911 crops did not give similar results in all productive soils; in strong soils many anomalies occurred, some crops (*e. g.* those of M. Crot, at Vevey) giving 60 % of abnormal roots. The plants showed what the market-gardeners call stoppage of sap, occurring at the beginning of summer owing to the drought. In autumn the cambial tissues renewed their activity and produced a second root above the first; numerous superposed layers were very conspicuous in the root, and the presence of anthocyan was frequently determined, this being a rare occurrence and evidence of abnormal nutrition. The upper root was also often cracked, the osmotic pressure of the cells having been too strong (as in the chrysanthemums).

The more cultivated plants are selected and improved, the more sensitive and delicate do they become, and the more are they subject to malformations.

MODONESI, M. " **Ammazzettamento** " (**Growing in Sheaves**) **of Wheat.** (L'ammazzettamento del frumento). — *Almanacco del Giornale d'Agricoltura " L'Italia Agricola ", per l'anno 1912*, pp. 51-63, 6 figg.; Piacenza, 1911. **416**

Italy: Umbria Todi

In the plains in the district of Todi, Umbria, which are liable to frequent overflows of the Tiber, at the end of February or early in March spots of varying extent are seen to appear in the same field, consisting of wheat plants which have great difficulty in growing as compared with those around them, and which furthermore present an excessive quantity of root shoots. Local farmers describe these plants as " ammazzettata " or " garofonate ", because they seem to be gathered into bunches (" mazzetti ") or again because they have the appearance of pinks (" garofani ").

" Ammazzettato " wheat constantly springs up in places which have been flooded by the Tiber and where the surface water has not been completely absorbed.

Under these circumstances, the wheat may be regarded as ruined. Its leaves, at first green and fleshy, become chlorotic and finely scarred and wrinkled; it withers and shrinks; with regard to the ears, they sometimes appear misshapen and with abortive flowers, and at other times they are not misshapen, but are small and quite empty and dry. In the former case microscopical examination has demonstrated the phenomenon to be due to the presence of *Sclerospora graminicola*; in the latter case, on the contrary, according to the author, a phenomenon of true asphyxia is in question, produced in these strong soils by the prolonged stagnation of the flood water. This water rapidly loses the small amount of oxygen it held in solution, on account of its having no flow, and the mud deposited by the Tiber forms a very hard crust at the surface, which, once it dries, imprisons the wheat roots beneath it.

To mitigate the deadly effects of " ammazzettamento " therefore, draining off of the flood waters must be facilitated, and that quickly, by digging suitable deep canals so as to provide a regular and easy issue for these waters; this indeed is the measure which has begun to be adopted, to much advantage, in the district of Todi.

It will also be as well to give the soil more rational and deeper ploughing.

BACTERIAL AND FUNGOID DISEASES

GENERALITIES.

COTTE, JULES. **Remarks in Connection with Zoocecidia and their Origin. Entomophytic Origin of a Large Number of Supposed Zoocecidia.** (Remarques au sujet des Zoocécidies et de leur origine. Origine entomophytique d'un grand nombre de prétendues Zoocécidies). — *Comptes rendus hebdomadaires des Séances de la Société de Biologie,* Tome LXXI, No. 37, pp. 737-741. Paris, 29 Décembre 1911. **417**

France

The author has frequently observed the presence of fungi in gall tissues, which led him to enquire into the real relations of these fungi to their host, and to examine whether it is logical always to attribute the formation of galls merely to the action of animal parasites. In this connection he sets out at length the following considerations :

1. There is an evident morphological similarity between Zoocecidia and Phytocecidia.

The principal galls produced by the Cynipidae resemble the bacterial galls; those of the Cecidomyidae, the Hemiptera and the Eriophyidae rather resemble the Mycocedia.

2. Animal species very far apart can produce lesions closely akin on plants.

3. On the other hand there is no uniformity in the behaviour of the galls produced by an animal species or even a genus.

4. One and the same parasite may act as a gall producer, or be inoffensive in appearance, according to the localities or times of the year.

5. There seems to be a real disproportion, in some cases, between the attack of a parasite and the lesion produced.

6. Some galls continue to grow after the disappearance of the parasite.

7. Other galls, on the contrary, form before the hatching of the eggs of the parasite, and consequently before the latter has been able, in any appreciable degree, to secrete the cecidogenous substance to which the gall is usually attributed.

The author then goes into his entomophytic theory, according to which a large number of supposed zoocecidia are, on the contrary, the result of the association of a fungus with an animal. Mr. Cotte proposes to give the product of the association the name of " phytozoocecidia ".

Observation has already established beyond doubt and dispute the part played by cryptogams in certain zoocecidia. The number of examples of this kind will certainly grow in the future.

The author does not mean to say that there are no zoocecidia proper. He merely thinks that their number is not so great as generally enumerated.

FUNGOID DISEASES.

418 NOFFRAY, E. **Nipplewort as the Principal Hotbed of the Downy Mildew in Lettuces.** — *Journal d'Agriculture pratique*, 75^e^ année, tome II, No. 51, pp. 781-783. Paris, 21 Décembre 1911.

For several years in succession, Mr Noffray noted that the invasions of *Bremia Lactucae*, which gives rise to the downy mildew in lettuces, are due in the majority of cases, if not almost all, to the presence of this fungus on the nipplewort (*Lapsana communis*). Groundsel, the sow thistle and the field thistle are not free from it, but are more rarely infected. **France**

The spread of the disease is helped by the carelessness of farmers, who do not destroy these plants, so plentiful both in kitchen gardens and their environs, and who often use nipplewort as a salad; besides this, they are unaware of the rapidity with which this fungus is propagated.

As a means of control, is advised first and foremost the destruction of the plants which act as hosts to the fungus; then the burning of the salad plants which appear diseased, before transplanting, and also the burning of the transplanted plants as soon as they show the first symptoms of the disease. Where large lots already infected are in question, they must be sold with all speed to avoid greater damage; finally, sowing and transplanting of the salads into infected soils must be interrupted for one year.

The use of copper salts as a means of controlling this disease yielded no good results in practice, and in addition caused depreciation of the salads

419 RAVAZ, L. and VERGE, G. **On the Mode of Infection of Vine Leaves by *Plasmopara viticola*** (1). — *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, Tome 153, No. 26, pp. 1502-1504. Paris, 26 décembre 1911.

Until the present time, infection of the upper surface of vine leaves by means of the conidia of *Plasmopara viticola* has been effected by drops of water well separated from each other, and above all having no communication with the under-side of the leaf. It has been observed by the writers that if the two leaf faces are kept covered with a continuous layer of water, and fresh conidia are deposited on the upper face, the leaf is infected within five days. The reason is that the zoospores given off by the conidia have succeded in reaching the lower face.

On the other hand, the works of Millardet and Gayon have made evident the fact that slight traces of sulphate of copper suffice to stop the germination of the conidia. Cupric washes and solutions spread over the upper surface, by preventing the germination of the conidia, at the same time form an obstacle to the passage of the zoospores down to the under side.

The writers infer from this, that it is not expedient to change the place where the cupric solutions are applied; it would moreover be practically impossible to spray them on the reverse surface of the leaf.

Gentle rains, leaving the under surface of the leaf dry, are always devoid of danger; this is not true of prolonged rains and dew, and above all of the thick fogs which cover the two faces of the leaf with a continuous watery stratum.

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(1) See also *B.* Nov.-Dec 1911, No. 3232. (*Ed.*).

RESISTANT PLANTS.

420 United States **Resistance to Rust of *Triticum dicoccum*.** — See above, No. 328.

421 Italy **Resistance of Some Varieties of Sugar Beet to *Cercospora*.** — See above, No. 336.

MEANS OF PREVENTION AND CONTROL.

422 France **Measures for Controlling Lettuce Mildew (*Bremia Lactucae*).** — See above, No. 418.

423 MARRE, E. **Lime-Sulphur Mixture as a Remedy for Fruit Tree Diseases** (1). — *Le progrès agricole et viticole*, 29^e année, No. 1, pp. 18-22. Montpellier, 7 Janvier 1912.

France Mr. Marre wished to make a trial in France of the new anticryptogam mixture proposed by W. M. Scott, plant pathologist in the Bureau of Plant Industry of the Ministry of Agriculture of the United States.

The original formula, which consisted of 2 kg. of powdered sulphur and 1 kg. of quicklime, thoroughly mixed in 100 litres of water, was modified by the writer as follows:

Powdered sulphur	kg.	3 (6.6 lb.)
Quicklime		2 (4.4 lb.)
Water	litres	100 (22 gals).

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(1) See *B.* May 1911, No. 1533-1535; Jan. 1912, No. 237. (*Ed.*).

The experiment was conducted in different localities according to the indications given by the writer, on cherry, peach and apple trees.

It is true that in 1911 the fine weather and drought were not favourable to the development of cryptogamic diseases; nevertheless in many cases the lime-sulphur wash gave excellent results, for instance against the leaf-curl of the peach (*Exoascus deformans*).

In addition, all the experimenters found that the trees treated vegetated better and remained fresher and greener than the others. This must probably be attributed to the presence of sulphur in the wash used.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS.

424
Italy: Umbria Todi

Sclerospora graminicola **and "Ammazzettamento" (Growing in Clumps) of Wheat.** See above, No. 416.

425

HORNE, A. S. **On Tumour and Canker in Potato.** (*Chrysophlyctis endobiotica* Schilb (1) and *Spongospora Solani* Brunch (2). Contribution from the Wisley Laboratory. XIII). — *The Journal of the Royal Horticultural Society*, Vol. XXXVII, Part 2, pp. 362-389, figs. 96-106. London, December 1911.

Great Britain

A historical summary is first given of the investigations undertaken by different writers in relation to the two serious diseases of the potato caused by *Chrysophlyctis endobiotica* Schilb (Potato tumour) and *Spongospora Solani* Brunch (Potato canker). The writer indicates the symptoms of each of these two diseases and the descriptions of *Spongospora* regarded as the oldest. Then he details the results of the observations made by him in open fields on this latter.

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(1) See *B.* Dec. 1910, p. 399; Feb. 1911, No. 610; March 1911, No. 1007; Nov.-Dec. 1911, No. 3280.

(2) See *B.* June 1911, Nos. 1890 and 1910. (*Ed.*).

At Cleadon, in 1910, *S. Solani* was rife. Mr. Horne straightway dismisses the idea of the disease having been, in this instance, introduced in the course of the same year by infected seed tubers, because the tubers experimented on were of different known origins; moreover they had been carefully selected, and finally the soil was found to be uniformly infected.

The variety "King Edward VII" was very seriously affected in some districts, while in others it was affected little or not at all, though other varieties again, in the same fields, were severely attacked.

The *Spongospora* may be found in a field without this necessarily meaning that the disease will spread there.

Adding lime to the soil in Cleadon resulted in increasing the intensity of the disease.

426 POLITIS, JOANNES. **A New Disease of Lily-of-the-Valley (*Convallaria majalis* Linn.) due to *Botrytis vulgaris* Fr.** (Una nuova malattia del Mughetto (*Convallaria majalis* Linn.) dovuta alla *Botrytis vulgaris* Fr.) *Rivista di Patologia vegetale*, Anno V, 3 pp., Pavia, 1911.

Italy: Pavia.

Last spring, in the Pavia Botanical Gardens, a number of Convallaria plants, both spontaneous and cultivated, were attacked by *Botrytis vulgaris* Fr. which caused great mischief to their vegetative parts and largely reduced the number of flowers.

The writer succeeded in reproducing the disease on healthy Convallaria plants, thus confirming the observations of Penzig, Cavara, Wehmer, R. E. Smith, Prunet, Farneti, Montemartini and Trinchieri on the parasitic action of this Mucedine, which is normally a saprophyte.

427 WOLF, A. FRED. **A Disease of the Cultivated Fig. (*Ficus Carica* L.)** *Annales Mycologici*, Vol. IX, No. 6, pp. 622-624, and figg. Berlin Dezember 1911.

United States

In August 1910 the Botanical Laboratory of the University of Texas received several partially decomposed figs. On these fruits the presence was observed of a mycelium, which suitably cultivated, finally produced a number of pycnidia, referable to *Macrophoma*, by the author identified with *M. Fici* Alm. and Cam. This species, which was discovered in Africa on the dead branches of *Ficus punctifera*, Waib., had not hitherto been encountered in America.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

428 **The Prevention of Clover Weeds.** (Uber Bekämpfung von Kleeunkräutern). — *Bericht der Landwirtschaftskammer für die Provinz Posen* 1906-1910, pp. 88-90. Posen, 1911. *Wiener landwirtschaftliche Zeitung*, 61. Jahrg. No. 4965, pp. 1065-1066. Wien, 27 Dezember 1911.

Germany Austria

In some parts of Germany and Austria, the clover weeds, particularly clover dodder, are now being energetically controlled. In order to secure the object in view, the seed breeding associations or seed control stations introduced the "Approval of Clover Seeds". A Commission, at the request of the owner, inspects the clover field carrying the seed clover, before it is mown. If dodder or other weeds should not be present, or any small patches of dodder be rendered harmless by thorough destruction, "approval" of the clover seed follows, which enables the grower to secure higher prices when selling his produce.

429 POLI, POLO. **Controlling « Crodo » or « Selvatico » Rice.** (Contro il riso "crodo" o "selvatico". — *Il Giornale di Risicoltura*, anno I, No. 14, pp. 214-215. Vercelli, 15 dicembre 1911.

Italy

Many are the regions infested by these subvarieties of rice, which take the generic name of « crodo » or « selvatico »; they cause such serious havoc that they sometimes mean enforced abandonment of the rice fields with heavy financial loss.

Although the injurious species of rice differ among themselves, they behave in almost the same way and even cause greater damage than that due to common weeds; in point of fact it is very hard to distinguish them, during the grass state, from cultivated rice. Furthermore, if the cultivated rice is bearded, the injurious rice does not, at the time of formation of the ear, present characters by which it might be recognised and rooted up.

« Selvatico » rice possesses superior vegetative power to that of other rices and can thus grow to the detriment of the latter; besides this, the seeds in proportion as they ripen, drop to the ground on the least shock.

The author advises in the first place, in order to prevent the spread of these pests, that flocks of geese should be turned out on the plots infested, where they will feed on and destroy a good proportion of the seeds scattered on the ground. The same plots could afterwards be submerged, especially if somewhat warm water is available, facilitating the germination of the caryopses remaining on the rice field. If this is not possible, it is always useful to burn the dry stubble on which some quantity of seed remains hanging.

As in practice there are drawbacks in suspending rice growing for some years on these infested lands and substituting dry cultures, the attempt might be made, as has already been done successfully at Valle Lomellina, to sow in drills, by which means all vegetation between the furrows might be destroyed, even if made up of plants which appear to be genuine rice.

480 C. B. **Destruction of Couch Grass.** (***Agropyron repens***) (1). *La Terre Vaudoise*, 3e Année, No. 50, p. 458. Lausanne, 16 décembre 1911.

A correspondent of the *Terre Vaudoise* writes to the latter journal:

Switzerland

« In the spring of 1910, I had a field which I intended to sow with lucerne. As it was invaded by couch grass, I proposed clearing it by the hand hoe, the horse hoe being unserviceable in this strong and compact soil. The very wet weather, however, made this work impossible. At the end of April I therefore sowed vetches on this field, and in July they gave a good hay crop. This forage gets laid and lies flat on the ground, smothering all the weeds and mellowing the land. After mowing, the field was perfectly clear and fit for the lucerne. The latter, sown at the beginning of April, was quite successful, and produced three good crops in 1911 ».

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(1) See also *B.* Aug.-Sept.-Oct. 1911, No. 3011. *Ed.*).

INSECT PESTS

GENERALITIES.

481 France **The Zoocecidia and their Origin.** — See above, No. 417.

482 JABLONOWSKI, JÓSEF (Director of the National Entomological Institute at Budapest). **Biology of the Wire-worm and Means of destroying it.** (A drótféreg elleni nédekezés). — *Köztelck*, No. 2061, pp. 2942-2943, fig. 315; and No. 2063, pp. 3006-3007. Budapest, November 18 and 25, 1911.

Hungary

The Author first remarks that these worms are not enemies properly so-called of cultivated plants, being more inclined to feed on wild ores; but that when the latter fail, they are equally ready to turn to cultivated plants, which according to him, accounts for the extraordinary numbers in which they appear.

The name " wire worm " is generally understood to describe those long-shaped, cylindrical larvae, of rigid, hard and shiny aspect suggestive of little bits of wire from half to one inch in length.

The greater number of these worms are larvae of different species of the Elateridae (Skipjacks); but wire-worms do exist which are not larvae of this family.

The worms, for instance, which cause so much damage to beets are the larvae of *Pedinus femoralis* L., and those which attack the roots of the vine are the larvae of *Opatrum sabulosum* L. Besides these, the larvae of a large number of other beetles are also included under the name wire-worm.

For practical reasons, the Author divides these worms into two groups: the Small and the Large Worms. He makes use of this division because some of these larvae when completely developed, are not more than from 15 to 22 mm. in length and from 1 to 1.5 mm. in thickness, while others measure from 22 to 26 × from 2 to 2.5 mm.

Another practical reason for this division into two groups is the circumstance, that while the small worms only eat those parts of the plants situated below the soil, the large wire-worm also injures the parts above as they develop in the spring.

The best-known species of the small worms and the small skipjacks is *Agriotes lineatus* L., and that of the group of large worms and large skipjacks is *Corymbites* (*Ludius*) *aeneus* L.

Examples of both species are met with everywhere in a perfect state from the beginning of spring to the end of autumn.

Towards the end of spring the female insect begins to lay her eggs in the ground, especially in grassy places. *i. e.* meadows, pastures, seed-leys, uncultivated fields, clover and lucerne fields, ill-cultivated fields of maize and beets or green stubble-fields, in fact any place likely to afford suitable nourishment to the larvae as soon as hatched.

These larvae at first feed on rootlets, and as long as they devour grass or weed-roots, the farmer is unaware of their presence, partly because the well-developed roots of wild plants are able to give sufficient nourishment to the plant, notwithstanding the action of the parasite. But the mischief is soon felt if by any chance the grass of the infested region becomes destroyed, perhaps by the plough ; then the worm, having no more grass to eat, settles on the cultivated plants which it destroys all the quicker and more effectually that the plant is weak and thinly sown. That is why the damage caused by the wire-worm is especially noticeable in autumn in plants which are still weak, or in spring in fields of maize or beets or in young tobacco plantations.

As the worms only feed during the night and as even the large ones, which come to the surface to feed, bury themselves in the ground again towards morning, they are consequently very rarely seen.

The larva lives for several years. It is rather rare, judging from certain carefully-preserved specimens, for the perfect insect to develop fully under two or three years; it is therefore probable that those in liberty also remain for at least two or three years in the larval stage.

The more or less extensive damage caused by these insects is generally noticed in land previously left fallow or grass-covered either as meadow land or for any other reason.

The first means of defence against the wire-worm consists therefore in keeping the soil free from weeds and not sowing crops in fields previously laid out in grass.

These conditions will be fulfilled by carefully ploughing the soil at the right time. And for this it will be necessary not to leave the soil too long unbroken after cutting the corn or any other cultivated plant; because whether flourishing or not, there is always enough vegetation among the stubble to attract the skipjacks in time to lay their eggs.

When once they have penetrated into the soil, the struggle to exterminate them becomes very difficult. The farmer must be most careful, in using vegetable manure, to turn it in so thoroughly that not a vestige of green is left on the surface, because in that case the skipjacks would select those very fields to lay their eggs in, where later on the larvae would find the food most suitable to their development.

Of course it will also be necessary to take means to prevent any possibility of fields, eventually uncropped, becoming covered with weeds: and this even at the cost of a second ploughing. In this way the beetles may be prevented from settling on the land. As for hoed crops, the same precautions must be taken and every means employed to preserve them from weeds. Weeding is even more important than the third hoeing, in fields of maize or beets at the end of summer when the skipjacks swarm in greatest numbers; because the larvae, although unable to injure the existing plants, will be all the more harmful to those sown in autumn or the following spring

It must be remembered that, by employing bad manure or by applying it at the wrong time the farmer by that very means, may encourage the spreading of these worms. If, let as say, he were to cover his fields at the end of spring or later, with manure containing seeds of weeds, or too fresh and too much mixed with straw; and if he were to leave it lying for some time, he would be doing the very thing to ensure his fields being overrun by the skipjacks, by means of the rapid growth of the seeds of weeds brought in the manure, and the scattering of the straw which has pratically the same effect as the weeds.

It is therefore evident that land should only be fed with good qualities of manure sufficiently seasoned and free from seeds of weeds; and that after this has been spread, especially in summer and autumn, it must as quickly as possible be turned under by the plough

The fight against wire-worms will be of special importance in the case of having to break up land previonsly down to grass, *i. e.* meadows, pastures, clover and lucerne fields, stubble fields and waste ground. All of these are undoubtedly infested with wire-worm, and fiields of young corn and the delicate shoots of young hoed plants, will become completely devastated by these larvae, unless some effective means of protection against them be taken.

As it is hardly possible to allow this newly-acquired land to lie fallow for a whole year, nor even to have it ploughed as often as necessary, because the grass becomes converted into humus, the best and surest means of defence would be to allow it to be overrun by pigs for at least two or three months after being ploughed.

The pigs would destroy the greater part of the worms, and as for the remainder, the only way would be, for example in the case of maize, to sow it more thickly than usual, so that the plants would sprout in greater numbers and serve to feed the worms left in the soil while developing sufficiently at the same time.

In the case of cultivated cereals or other more thickly-sown plants, they must be strengthened against the attacks of the worms not destroyed, by the employment of artificial manure suitable to the special requirements of the soil.

During periods of change of culture damage will always be done by the wire-worm, as there is no known remedy capable of immediately destroying worms in large extents of soil without considerable expense; therefore every necessary precaution must be taken to lessen the damage done.

As this may sometimes be pretty great, it is in the interest of every farmer always to keep his fields free from weeds ; he will by this means succeed in preventing the skipjacks from settling in his land and infesting his crops.

423 DECOPPET. **Biology of the Cockchafer.** (Biologie du Hanneton). — *La Terre Vaudoise*, 3e Année, No. 50, pp. 453-455. Lausanne, 16 décembre, 1911.

Switzerland

A thorough study of the life conditions and habits of insect pests suggests at the same time the means of controlling and destroying them. Anyone desiring to gain a full knowledge of the biology of the cockchafer will be surprised to see how poor is the supply of information in relation to this insect, the damage caused by which is nevertheless so extensive thet it sometimes runs into considerable sums.

With a view to penetrating more deeply into the secrets of the life of this pest, Mr. Decoppet, professor of sylviculture in the Federal Polytechnic School in Zürich, undertook, under the auspices of the Central Forestry Experiment Station in Zürich, enquiries at the nursery at Farzin (Vaud) *i. e.* in a region where the farm and forest ravages caused by the cockchafer and its larva, the white grub, are often exceedingly great. The following is a summary of the observations of M. Decoppet:

« The common cockchafer appears in the spring (April, May and June), earlier or later according to the altitude, climate, temperature etc. It flies about chiefly in the evening during twilight, and feeds on the leaves of most of the forest tree species, the oak, the beech, the maple, and the birch in particular ; it also eats the fresh needles of the larch. This insect is a plague to farmers also, as it attacks fruit trees and sometimes strips them of their leaves.

The female, after fecundation, chooses a loose, dry soil, not too much under cover, but exposed to the sun, and deposits its eggs therein at a depth of 10-25 cm. (4 to 10 inches), according to the compactness of the soil. These eggs, 60 to 70 in number, are deposited in layings of 10 to 30 in each hole dug by the female.

In about 4 to 6 weeks the larvae (white grubs) hatch; they first live in companies, feeding on the half decomposed parts of plants, then on the radicles and the root hairs. True, this damage is hardly perceptible most of the time When the winter draws near, the white grubs make their way into the soil to hibernate at a depth of 30-50 cm. (12 to 20 inches) and more, according to the soil, altitude and climate.

In the following spring (March, and April) the white grubs approach the surface, and then begin to work havoc, often very considerable, because prolonged through the whole summer, the voracity of the larvae increasing as they grow. They eat the root hairs and the roots of seedlings and rees (Pines, Spruces, Larches, Silver Firs) and the greater part of the leaves, likewise those of grasses and some field crops.

These depredations are continued very late into the autumn, after which the white grubs once more make their way down to lower depths to hibernate a second time. On the arrival of the spring they ascend into the upper layers and continue their injurious work more or less late into the summer (July, August, September), after which once again they burrow their way downwards, and on reaching the required depth (30-50 cm. (12 to 20 in.) and more) they prepare chambers with hard, solid walls in which they enter the chrysalis stage.

In September or October the perfect insect emerges from the chrysalis, but remains in the chamber where hatched ; it leaves the latter in the following spring (April, May, June) to enter on its flight, seek its new food, reproduce itself and die.

The cockchafer thus requires several years for its complete development. The appearance of the insect in large quantities recurs periodically (cockchafer or flight years), every 3-5 years, according to the local conditions; adjoining regions sometimes have different years of flight. In Switzerland, triennial generation is the rule, three series of cockchafer years being distinguished, that of Berne (1909, 1912, 1915 etc.), that of Uri (1910, 1913, 1916 etc.) and that of Basle (1911, 1914, 1917). The insect of the Berne year occupies the most extensive area.

494 GRASSI, B. and TOPI, M. **Recent Researches on the Spontaneous Spread of Phylloxera.** (Nuovi studî sulla diffusione spontanea della fillossera). — *Rendiconti delle Sedute della Reale Accademia dei Lincei, Classe di Scienze fis., matem. e nat.*, vol. XX, fasc. 11, 2° sem., pp. 603-610. Roma, 3 dicembre 1911.

Italy

From the total of the experiments carried out on European vines at Fauglia last summer, in continuation of the studies in connection with the spontaneous spread of phylloxera the authors make the following deductions

1. It is wholly unlikely that phylloxera can, in compact earth, not fissured or mined, effect its spread through the earth without returning to the surface, and thus infecting the roots of other vines.

2. The influence of light on the direction of the path of the new-born phylloxera insect is beyond doubt it is attracted by light as certain moths by the lamp

3. It is likewise beyond doubt, on the other hand, that the new-born phylloxera insects can attach themselves and grow without ever having seen the light taking up their abode on the same root on which they are born, (after returning to it, should they happen to have left it). Or they may pass to the other roots of the same or different vines, either in contact with or quite close to the first, traversing the fissures in the soil, the galleries burrowed by animals, the cavities formed by the working of the soil, by decomposition, by putrefaction of organic substances, etc.

4. It is not in the like degree certain, but is nevertheless probable, that the new-born phylloxera insect reaches the surface whenever attracted there by a little light through the soil; thus the insect obeys the influence of positive phototropism to which it is certainly subject; independently of the quality and quantity of the food it finds available. Probably, once it has reached the surface, the insect does not descend again, until after night has set in.

PICARD, F. **The Scale Insects of the Vine.** — *Le Progrès agricole et viticole*, 29e année, No. 1, pp. 10-18, chromo 1 pl. Montpellier, 7 Janvier 1912. **405**

France

Independently of *Margarodes vitium* of South America and numerous other exotic forms, or those which are rare or accidental in Europe, seven species of scale insects are common on the vines in France and the Mediterranean basin : *Aspidiotus* (*Targionia*) *Vitis; Diaspis pentagona ; Lecanium Persicae ; L. Corni ; Pulvinaria Vitis; Dactylopius Vitis ; Rhizoecus falcifer.*

Aspidiotus Vitis, Pulvinaria Vitis and *Dactylopius Vitis* are the three species most specialized to the vine, the others being found on very different plants.

Among these species, five are chiefly southern; while *Pulvinaria Vitis* and *Lecanium Corni* are as abundant in the North as in the South of France.

After having described the different species named above, the writer points out that the ravages caused in France by the scale insects are inextensive or localised. Nevertheless, it is necessary to control these insects. Cutting and burning the vine shoots gets rid of a large number of them. To destroy those remaining on the stock, the latter should be rubbed with a large brush or a coarse piece of cloth, this operation being followed by a brush application of one of the following mixtures:

a) *V. Mayet's formula*:

Water	gr.	1000
Soft soap dissolved hot	»	300
Heavy Oil	»	5
Naphthalin	»	5

b) *Marchal's formula* :

Water	gr.	1600
Soft soap	»	200
Seed Oil	»	150
Petrol	»	100

The scale insects which hibernate beneath the bark, such as the *Dactylopius*, must be destroyed by stripping off and burning the bark. The stock should afterwards be coated with the following mixture:

Crude petrol	100
Naphthalin	5
Powdered lime	10

486 Guenaux, G. **Insects as Useful Auxiliaries in Agriculture.** — *La Vie agricole et rurale,* No. 2, pp. 28-30. Paris, 9 Décembre 1911.

France United States

A new method of combating crop parasites consists in making use of the insects themselves. Though a number of insects feed on vegetables, an almost equal number only live at the expense of their fellows, and as they thus exterminate the plant-destroying insects, they are valuable auxiliaries to the farmer. In the first category are predatory insects which kill other insects for their food: such are the crab-beetle, the tiger-beetle, the rove-beetle, the lady-bird, the soothsayer, the pearl-fly, etc. Another category comprises the parasitic insects proper, which destroy the other insects so as to grow at their expense.

Farmers frequently have occasion to observe that an invasion of insect pests, after having wrought havoc for one or two years, suddenly disappears; the spinning caterpillars of the apple and plum tree, the Cecidomyiidae of wheat and oats, the larvae of processionary moths of the pine, etc., are subject to these sudden alternations of appearance. This is due to the action of the parasitic insects.

These valuable auxiliaries should be fostered by the farmer by protecting them against all destructive causes. Still more, when circumstances require, he should undertake breeding in order to propagate and acclimatise them.

The most striking example of the usefulness of insect auxiliaries is that furnished by *Novius cardinalis.* About 1868 an Australian scale, *Icerya Purchasi,* was introduced into California and soon caused the most terribic ravages in orange and lemon plantations. The entomologist Riley, struck by the insignificance of the mischief wrought in Australia by that same scale, conceived the idea of acclimatising in California the natural enemies which it must have in its country of origin. Thus, in 1888, there was imported a small Ladybird, *Novius cardinalis,* which was cultivated and distributed to California fruit growers. The result was wonderful: the destructive scale, devoured by the Novius, disappeared in a very short time from all plantations. The same conclusive experiment took place in 1898 in Florida. The *Icerya* also appeared in the Cape about 1890, in the Hawai Islands in 1889, in Portugal in 1897 and in Italy in 1900; an insect closely akin to the last named, *Icerya aegyptiaca,* also made its appearance in Egypt about 1890. In all these countries recourse was had to *Novius cardinalis,* and everywhere success was complete.

In order to breed and propagate an insect auxiliary, it is only requisite to place it on plants infected by the pest on which it lives, and surround each plant on all sides wlth a large metallic gauze cage or a kind of glass house. Inside the cage a stand is provided, covered with cardboard squares, on which the insect hosts are placed. The insect auxiliaries eat the living food placed on these " plates " and deposit their eggs there, so that by conveying the pieces of cardboard to other infected trees the number of colonies of the useful insect is easily multiplied.

In France there are also carnivorous insects, particularly several ladybirds, which it would be desirable to protect and propagate; such is *Rhizobius litura*, which is a great destroyer of plant lice and scale; *Exochomus quadripustulatus* and *Chilocorus bivulnerus;* which are enormous consumers of scales, and which have been seen; in the Department of the Drôme, to arrest an alarming invasion of the black olive tree scale.

The brown-tail moth (*Euproctis chrysorrhoea*) and the gipsy moth (*Liparis dispar*) were accidentally imported a short time ago into the United States, but without their parasites which so successfully arrest their propagation in Europe.

In spite of enormous sacrifices, the destructive agents put into operation were powerless to put a stop to the conquering progress of the insect pests. There remained recourse to the parasites of the two moths: from 1906 to 1909 the State of Massachusetts every year appropriated a sum of 252 000 fr. (£10 000) for the importation of these parasites. The Saugus Laboratory devoted itself to the work of breeding the parasites, identifying them, ascertaining their value and acclimatising the good species. The beneficial action of different species selected in this way has already made itself felt in several forests (1).

In conclusion it may be said that methods of destruction by insecticides generally give good results where intermittent and temporary appearances of the deleterious insects are to be combated. When the invasion continues, it is imperative to call natural auxiliaries to aid.

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(1) See *B.* Aug.-Sept -Oct. 1911, Nos. 3023 and 3025. (*Ed.*).

487 PICARD, F. **The Potato Moth (*Phtorimaea operculella* Zett.) in France**. (1) (Sur la présence en France et sur la biologie de la Teigne des Pommes de terre). *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, Tome 154, No. 2, pp. 84-86. Paris, 8 Janvier 1912.

The writer notes the presence in France of this moth, now spread all over the world, and gives its life-history.

France

It is found in the Var, especially in the Commune of Bormes, where, since 1902, it has been doing more and more damage to potatoes.

It seems that this moth may even invade the cooler parts of France ; two of them have already been captured near Paris.

The Government measures against this pest will no doubt serve to check its spread.

488 BODKIN, G. E. **Aleyrodidae of Economic Importance. With Description of a Species Prevalent in British Guiana.** —*The Journal of the Board of Agriculture of British Guiana*, Vol. V, No. 2, pp. 83-86. Illustr. 9. Demerara, October, 1911.

British Guiana

This family of insects is of frequent occurrence in British Guiana and causes more damage to economic plants than is generally realised. The *Aleyrodidae* are mostly confined to tropical or semi-tropical regions, probably owing to the fact that they feed exclusively on the leaves of their host plant and are thus not so likely to be distributed in shipments of trees and plants, as if occurring on the twigs and branches. Nearly all the species are omnivorous, and when once thoroughly established in a locality spread rapidly, as the adults of both sexes are winged. Several species are of very considerable economic importance, among them being *Aleyrodes Citri* and *A. Howardii* infesting the orange, *A. Cocois* infesting the coconut and guava, *Aleyrodicus Anonae* infesting custard apples, and a couple of species reported as causing considerable damage to the sugar cane in Java. The winged adults shelter on the under sides of the leaves, while the larvae are to be found on both surfaces. Not only do they weaken the plant by sucking the sap, but their waxy secretions block up the stomata, thus interfering with one of the most vital functions of the plant.

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(1) See *B*. June 1911, No 1973 (*Ed.*).

This waxy secretion eventually gives rise to a fungus appearing as a black incrustation covering both sides of the leaves. It is particularly troublesome in the case of the orange, for here it often attacks the fruit. A parasitic fungus (*Aschersonia Aleyrodis*) keeps these insects in check to a certain extent, and in Florida the spores are artificially disseminated with excellent results.

Other remedial measures consist in spraying with a good resin wash or kerosene emulsion.

Schematic illustrations and descriptions (of the larva, pupa and adult) are given of a species of *Aleyrodes* prevalent in British Guiana. Exact identification of the species here described is not at present possible.

This particular species has already been observed infesting species of *Anona* in Georgetown, also cassava plants on the East Coast, where it was doing considerable damage.

When large numbers of *Aleyrodidae* appear on a plant they are frequently parasitised by a species of Chalcid fly. These insects may often be observed pupating within the pupae of their hosts.

G. E. B. **Insect Pests of British Guiana and Methods for their Control.** (Mr. Quelch's Work on Insect Pests). — *The Journal of the Board of Agriculture of British Guiana*, Vol. V, No. 2, pp. 99-101. Demerara, October, 1911. **490**

British Guiana

Mr. Quelch has worked out the problem of *Castnia licus* and other insects attacking the sugar cane in British Guiana. He states that in controlling *C. licus* "the main hope lies in the systematic application of artificial remedial measures and if they are properly carried out, there should be no great difficulty in reducing this pest to such a degree as to render it but an irregular feature of the cultivation, though one that would require continual watchfulness". Moths secured in the newly cleared areas reduce very considerably the chances of a heavy development in standing canes in the neighbourhood.

Mr. Quelch also emphasises the encouragement of active natural agencies such as birds, parasitic insects, etc., and to this end he advises that there should be provided for the birds suitable bush and tree belts for their shelter, protection and nesting. He condemns the practice of burning the fields as reducing the fertility of the soil by the destruction of humus and affecting the alcalinity ; further, various natural agencies which control the enemies of the cane are either destroyed by burning or driven away, while the majority of the pests themselves are secure from fire.

The author also demonstrated the occurrence in the fields of three distinct species of the Small Moth-Borer, at one time known collectively as *Diatraea saccharalis*. These he now identifies as *D. canella*, *D. saccharalis* and *D. lineolata*, giving also a full description of the various life stages. The early cutting out of these small pests from the cane is an absolute necessity, for their breeding capacity is enormous. For their further control, Mr. Quelch advocates the use of trap lights. Two egg parasites of the Small Moth-Borer have been discovered by him, which he considers to be identical with two such forms described from Java, *Ceraphron beneficiens* and *Chaetosticha nana*.

440 G. E. B. **Moth Borers.** — *The Journal of the Board of Agriculture of British Guiana*, Vol. V, No. 2, p. 72. Demerara, October, 1911.

British Guiana

Insect pests such as the Giant Moth-Borer (*Castnia licus*) and species of the Small Moth-Borer by no means confine their attention to the sugar cane.

The Small Moth Borer (*Diatraea saccharalis*), whose natural food is grasses, has lately been discovered doing considerable damage to the experimental rice fields at the Botanic Gardens. Boring into the stem of the plant at the distance of a few inches from the ground, it penetrates up to the growing point, eventually killing out the whole shoot. Its ravages were checked to a certain extent by means of trap-lights set up at different points and also by cutting out all dead or dying plants which contained either a larva or pupa. Several instances of parasitised eggs were met with. The Giant Moth-Borer, apart from its ravages in the sugar cane, has already been reported as attacking plantains. Its latest development, however, has been the destruction of very young coconut palms. The larva bores a hole through the stem just above where it emerges from the coconut, eating out the entire centre of the shoot and killing the plant. Damage to young palms is also often occasioned by a beetle (*Strategus alveus*).

MORSTATT, H. Insect Pests Infecting Seeds, and Means of Disinfection. (Saatgut- und Vorratsschädlinge und Saatgutdesinfektion). — *Der Pflanzer*, Jahrg. VII, Nr. 10, pp. 576-604, Taf. 9-10. Daressalam, Oktober 1911. **441**

German E. Africa

The following insects which are injurious to Maize seeds are described separately: *Calandra Oryzae* L.; *Sitotroga cerealella* Oliv.; *Laemophloeus pusillus* F.; *Tribolium ferrugineum* Fabr.; *Trogosita mauretanica* L.; and *Ephestia cahiritella* Zell.

As insect pests attacking cotton seeds the following are described: *Calandra* sp.; *Laemophloeus pusillus*; *Tribolium ferrugineum*; *T. confusum* Duv. *Trogosita mauretanica*, *Silvanus surinamensis*; *Cathorama* sp.; *Palorus melinus* Hbst.; *Gelechia gossypiella* Saund. and *Tinea* sp.

Mr Morstatt furthermore mentions as pests attacking various cereals and vegetable produce, *Aracocerus fasciculatus* Geer., and, as attacking the seeds of leguminous plants, *Bruchus chinensis* L. and *Apion* sp.

Finally, he enumerates the substances most appropriate for disinfection of the seeds attacked by the above insects. They are sulphide of carbon, tetrachloride of carbon, hydrocyanic acid, naphthalin, insecticidal powder, sublimate, formalin, etc.

RESISTANT PLANTS

SANNINO, F. A. **Direct Producers Substituted for the Clinton Vine.** (I produttori diretti in sostituzione del "Clinton"). — *La Rivista*, Anno XVIII, Serie V, No. 1, pp. 5-7; Conegliano, 1º Gennaio 1911. **442**

Italy

The "Clinton" vine, a natural hybrid of "Labrusca" and "Riparia", was formerly found very widely in Venetia, the provinces of Cuneo, Turin and Rome, because it was believed to be endowed with a number of qualities, such as resistance to mildew and phylloxera, abundant and certain fruiting, lower cost of cultivation in comparison with that of the native vine, and rapidity of growth.

Failures of the "Clinton" however were not slow in coming to light. About 1900, in the environs of Treviso, vine stocks perish-ing from phylloxera were found, which furnished confirmation of what had already happened in France and Sicily.

Then followed the over-production crisis in the years 1901, 1907-1908, which caused the "Clinton" wines to suffer still greater depreciation than the others, and furthermore the productivity of this vine became liable to exhaustion.

According to the writer, this latter drawback might be obviated by means of more restricted pruning and complete fertilisation with strong doses of nitrogenous, potash, and phosphate manures, so as to secure an abundant production of good wood increasing the diameter of the stocks and the root, and also lengthening the vine shoots to some extent.

But in addition to the disadvantages already enumerated, the "Clinton" also presents that of suffering greatly from drought. For all these reasons many vine growers are at present endeavouring to replace the "Clinton" by other direct producers of French origin, which first and foremost offer a greater resistance to phylloxera than does the "Clinton", are abundantly and durably productive and will retain the resisting powers of the "Clinton" to cryptogamic diseases.

MEANS OF PREVENTION AND CONTROL.

443
British Guiana

***Aschersonia Aleyrodis*, parasitic on the Aleyrodidae.** See above, No. 438.

444

HUGUES ALBERT. **The Ladybird and Cochylis.** (Bêtes a bon Dieu et Cochylis). — *Le Progrès agricole et viticole*, 28e Année, No. 52, pp. 770-771. Montpellier, 24 Décembre 1911

France

In November 1909, a number of Ladybirds (*Coccinella septempunctata, C. variabilis*, etc.) were observed concealed beneath the bark of some vine plants. In the spring of 1910, the writer noted the presence of larvae of the same Coccinellae on the leaves of the vines, and a simultaneous diminution of the damage caused to the latter by the Cochylis.

Pending fresh observations which it was impossible to make till 1911, owing to the scarcity of the Coccinellae, Mr Hugues recalls that as far back as 1893, Mr J. Perraud of the Viticultural Station of Villefranche (Rhône), brought under the notice of the Entomological Society of France, *Coccinella septempunctata* as a parasite of the Cochylis; he had observed larvae of the former devouring the grubs of the latter.

YOTHERS, M. A **Perillus claudus a Beneficial Insect.** — *The Canadian Entomologist*, Vol. XLIII, No. 12, p. 418. London, Ontario, December, 1911. **445**

Canada. United States

Dr. Bethune has noticed the predaceous work of *Perillus claudus* Say, on the Colorado potato beetle (*Doryphora decemlineata*). The writer also reports the good work of this insect in Michigan during the years 1908 and 1909. It was claimed that in several localities of Michigan it was doing so much good that spraying was hardly necessary. It was known to attack the larvae and nymphs. The method of its attack was to pierce with its mouth-parts the soft skin of the larvae or nymph and suck out the juice.

There seems to have been a northward spread of this insect, as it was not formerly known to occur as far north as Illinois, and it was noticed in 1908 and in 1909 in Michigan and in Ontario in 1911.

Means of Checking Wire-worms. See above, No. 432. **446 Hungary**

Measures against Pulse Weevils. See below, No. 456. **447 Italy**

Disinfection against Pests of Grain in German East Africa See above, No. 441. **448 German East Africa**

Means of Control of Insects injurious to the Sugar-cane in British Guiana. — See above, No. 439. **449 British Guiana**

450 France **Means of Control of the Vine Scale Insects.** — See above, No. 435.

451 **Enquiry as to the Effects of Bark Stripping Against *Cochylis.*** — *Le Progrès agricole et viticole.* 28e Année, No. 50, pp. 694-698, et No. 52, pp. 758-763; Montpellier, 10 et 24 Décembre 1911.

France "Le Progrès agricole et viticole", of Montpellier, recently opened en enquiry among its readers as to the effects of bark stripping against the Cochylis, requesting them to make known, not the result of laboratory observations, but those of facts found by open-air observation.

The year 1911 was not favourable to experiments of this kind, because the intense summer heat was largely responsible for the destruction of this insect. Nevertheless the replies already received by this paper make it clear that the majority of its correspondents, who are distributed throughout different districts, are inclined to regard bark stripping as an effective measure.

452 Argentina **Means of Controlling *Oeceticus platensis* ("Bicho de Cesto") in Argentina.** — See below, No. 459.

INSECTS INJURIOUS TO VARIOUS CROPS.

453 German East Africa **Insects injurious to Cereals in German East Africa.** — See above, No. 441.

454 German East Africa **Insects injurious to Maize in German East Africa.** — See above, No. 441.

455 Java **Insects injurious to Rice in Java.** — See above, No. 329.

MORETTINI, A. The Pulse Weevils. (Danni e mezzi di lotta contro i bruchi delle leguminose). — 20 pp. Perugia, 1911. 456

Italy

The seeds of the principal pulse (broad beans, lentils, green peas, chick peas and the chickling vetch) are liable to the attacks of weevils (*Bruchus* spp.) which, as has been already pointed out by previous writers, reduce considerably the germinating power of the seeds.

The observations which the Author has just undertaken make it furthermore evident that the Bruchidae lead to a notable falling off in weight of the seeds, as may be seen from the following table:

	Effective loss of weight			
	of 1000 seeds		per hectol.	per bushel
	grams	oz.	kg.	lb.
Broad Bean	154.38	5.40	8.707	6.966
Tick Beans	65.97	2.31	12.864	10.291
Ordinary gren peas .	70.84	2.48	21.074	16.859
Forage peas	41.69	1.46	17.961	14.369
Lentils	15.98	0.56	17.634	14.107
Vetchlings	13.12	0.46	34.059	27.247

The presence of weevils also reduces the consumption of the seeds for human food, and consequently their value.

The most usual expedients adopted to obviate the ravages of these insects are the following:

1. The use of high temperatures, dry or moist. Usually a temperature of 50-60° C. is necessary.
2. Keeping the pulse in air-tight places; the gradual consumption of oxygen and production of carbon-dioxide kill the larvae in the seeds.

Nevertheless the former of these methods is expensive; besides, it cannot be applied with perfect safety to seeds for sowing. As to the second, it can only be adopted in relation to small quantities and it is slow in action.

A method which is on the contrary practical, effective and inexpensive, is the use of sulphide of carbon; it must however be resorted to as soon as possible. Within a maximum of 12 hours, it acts without detriment to the germinating power of the seeds, even if used in large quantities.

In a test made on broad beans, the Author observed that there was a gain of 2.620 kilogrammes per hectolitre in comparison with the untreated beans (2.09 lb. per bushel). Furthermore, the beans were of better appearance and consequently fetched a higher price.

457 German East Africa **Insects injurious to Pulse in German East Africa.** — See above, No 441.

458 German East Africa **Insects injurious to Cotton Seed in German East Africa.** — See above, No. 441.

459 HUERGO, JOSÉ M. (hijo). ***Oeceticus Platensis* ("Bicho de Cesto") in Argentina.** (El "Bicho de Cesto" y su destrucción). — *Boletin del Ministerio de Agricultura,* Tomo XIII, No. 9, p. 590-626, 15 figg., Buenos Aires, Septiembre de 1911.

Argentina In Argentina the names "Bicho de cesto" or "Canasto" are only given to an indigenous lepidopter, *Oeceticus platensis,* well known owing to the cocoon ("cesto") in the shelter of which it passes the winter.

In the grub state, *Oeceticus platensis* attacks a large number of fruit, forest, kitchen garden, forage and garden plants; it strips them of their leaves and at times goes so far as to ravage the fruits. This insect cuts off the leaves and young branches not only to provide itself with food, but also to make its cocoon.

The *Oeceticus* has various natural enemies, but they have not been sufficient up to now to prevent the spread of this insect and the constantly growing damage it gives rise to. Among insects its most formidable enemies are: *Pimpla brasiliensis, P. Tomyris, Tetrastichus platensis, Smicka Bergi* and *Phorocera xauthura.*

To keep this pest under, resort is advised, in spring, to washing with ammoniacal liquids on the first appearance of the new generation of the *Oeceticus;* these brush applications must be repeated at fifteen days' interval from the first. In summer, it may be necessary to renew the application in the event of fresh invasions, or if the spring treatment has not yielded good results. During winter, finally, the cocoons should be collected and burnt as an additional precaution.

HEMPEL A. *Lepidosaphes Beckii* Newm. (1) A Parasite of the Orange Tree in North and South America. (Un enemigo de los naranjos). — *Revista de la Asociación Rural del Uruguay*, Año XL, No. 11, pp. 823-824. Montevideo, Noviembre de 1911. **400**

North and South America

The most formidable enemies of the orange tree are insects of the family of the *Coccidae* of which the sub-family *Diaspinae* comprises 25 species; out of this total, 13 have already been found in Brazil, where they are all parasites of citrus trees. *Lepidosaphes Beckii* attacks orange trees both in North and South America. The author describes its characters and the nature of the damage caused, and gives the methods of control to be used. He particularly advises brush applications of an emulsion of residues of petroleum distillation, for which emulsion he gives the formula and the mode of application.

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(1) See *B*. May 1911, No. 1556 and *B*. June 1911, No. 1967. (*Ed*).

INTERNATIONAL INSTITUTE OF AGRICULTURE

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THE INTERNATIONAL INSTITUTE OF AGRICULTURE

The International Institute of Agriculture was established under the International Treaty of June 7th, 1905, which was ratified by 40 Governments. Ten other Governments have since adhered to the Institute.

It is a Government Institution in which each Country is represented by delegates. The Institute is composed of a General Assembly and a Permanent Committee.

The Institute, confining its operations within an international sphere, shall

a) Collect, study, and publish as promptly as possible statistical, technical or economic information concerning farming, vegetable and animal products, the commerce in agricultural products, and the prices prevailing in the various markets,

b) Communicate to parties interested, also as promptly as possible, the above information;

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f) Submit to the approval of the Governments, if there is occasion for it, measures for the protection of the common interests of farmers and for the improvement of their conditions, after having utilized all the necessary sources of information, such as the wishes expressed by international or other agricultural congresses or by congresses of sciences applied to agriculture, or agricultural societies, academies, learned bodies, etc.

The Institute publishes: *a*) a Bulletin of Agricultural Statistics; *b*) a Bulletin of Agricultural Intelligence and Diseases of

Plants; *c*) a Bulletin of Economic and Social Intelligence; *d*) a Bulletin Bibliographique hebdomadaire (published every Saturday).

It has also published a volume on " The Organization of Agricultural Statistical Services in the Several Countries ", and a volume on " Statistics of Cultivated Areas and of Vegetable and Animal Production in the Adhering Countries " (an Inventory drawn up from documents published by Governments), and " Monographs on Agricultural Association in Various Countries (2. Vol) ".

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The information contained in some of the abstracts dealing with Canada has been most kindly placed at the disposal of the Institute by the Government of the Dominion.

The Canadian abstracting is by Mr. J. K. Doherty, the able chief of the Canadian Bureau of Correspondence with the International Institute of Agriculture.

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AGRICULTURAL INTELLIGENCE

NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of January-February 1912.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES DEALING WITH AGRICULTURE AND INDUSTRIES DEPENDENT ON IT.

Budget of the Department of Agriculture of Hungary for 1912. — Allami költségvetés az 1912 évre, Részletezés V füzet. 461

Hungary

The budget of the Department of Agriculture of Hungary for the year 1912 anticipates the following expenditure arranged under the heads of the principal branches of the administration (1):

Chapter and Title		Name of Branch	Budget 1912	Budget 1911
		I. *Ordinary Expenses.*	£ s. d.	£ s. d.
XX.	I.	Central Administration	63 080.13. 4.	57 742. 2.6.
»	2-7.	Forestry	903 872. 1. 8	818 991 9.2.
»	8, 9.	Horse-breeding, management of the stud-farms and of the Gödôllö estate	659 412.19. 2.	635 084. 5.0.
»	10, 11.	Veterinaries, Veterinary College	150 487.10. 0.	146 115. 6 8.
»	12, 13, 27, 29, 31.	Agric. instruction, Experimental Stations and Institutes, Institutes of meteorology, geomagnetism, and geology	182 158. 5. 0.	175 146. 5.0.
		Carried forward	1 959 011. 9. 2.	1 833 079. 8.4.

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(1) In this table, and throughout the article, the crown is reckoned at exactly 10*d*. (*Ed.*).

		Brougt forward . . .	1 959 011. 9. 2.	1 833 079. 8.4.
XX	14.	Cattle-breeding, Dairy. .	160 405. 8. 4.	251 205.17.6.
»	15, 16.	Administration of hydrotechnic service	122 573. 2. 6.	126 947. 9.2.
»	17-26, 30.	Fisheries, Viticulture, Apiculture, Estates of the State, Sericulture . . .	541 600.10. 0.	509 004.15.0.
»	28, 32.	Assistance of agric. labourers and of the mountain population .	138 931. 8. 4.	119 772.11.8.
IV, IX.	10, 4.	Pensions and debts chargeable to the ministry .	185 280.12. 6.	180 084. 2.6.
		Total of ordinary expenses . . .	3 107 802.10.10.	3 020 094. 4.2.
		II. *Extraordinary expenses.*		
VIII, II.	1-27, 2.	Temporary expenses and pensions	330 713.19. 2.	278 022.11.8.
V, IX.	1-17.	Capital employed	634 403.15. 0.	471 616[illegible] 6.
		Total of extraordinary expenses . .	965 117.14. 2.	749 638.14.2.
		General Total . . .	4 072 920. 5. 0.	3 769 732.18.4.

The necessary credit for 1912 exceeds therefore that of 1911 by more than £ 300 000.

The increase is divided among all the different branches of the administration, except those of cattle-breeding and of the administration of the hydrotechnic service, of which the credits for 1912 were lower than those for 1911 by the amounts of £ 90 800.9*s*. 2*d*. and £ 4 372.6*s*. 8*d* respectively. The decrease in expenditure in 1911 is however only apparent, because under the heading " Cattle-Breeding " for 1911 there is included an outlay of £ 187 500 and also receipts consisting of annuities (paid in often very late) for bulls for breeding sold to the breeders at special prices. The amount actually used under this head was therefore only the difference between the two sums mentioned, *viz.* £ 375 000. However, the budget of 1912 has not reckoned on any receipts in fixing the sum allocated, so that the whole of the credit, amounting to £ 83 333.6*s*. 8*d*. will be available for cattle-breeding and exceed by more than £ 40 000 the amount actually used in 1911.

The difference observed in the heading " Hydrotechnic Service " must be attributed to the fact that an entire branch of this service, that of the Section of Hygienic Engineers, has been transfered to the Department of the Interior; the decrease is thus only apparent.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

462

Exportation of Agricultural Produce from Morocco. (Les exportations de produits agricoles du Maroc). - *Questions Diplomatiques et Coloniales*, No. 38, pp. 122-123. Paris, 12 Janvier 1912.

Morocco

Moroccan agricultural produce comprises:

1. Food products of animal and vegetable origin: oxen, poultry, eggs, etc., the consignments of which in 1909 attained a value of 8 285 200 francs (1), or nearly one-fifth of the total exports.

2. Raw materials for industrial purposes, *viz.* beeswax, the shipments of which in 1909 reached a value of 606 257 francs, chiefly destined for Hamburg; wool (2 693 310 francs) and cowhides, sheep and goat skins, exported to the values of 722 350 francs, 4 684 268 francs, and 1 000 000 francs respectively in 1909. The best customers for skins are France, Germany, Spain and the United States.

The exports of agricultural produce proper in 1909 were of a value of 20 307 143 francs.

The following table indicates the most important of them:

	Fr.
Barley	12 231 514
Beans	2 135 963
Wheat	2 011 264
Fenugreek	1 033 861
Linseed	976 703
Canary seed, millet and sorghum	644 567
Maize	492 299
Cumin seed	295 897
Coriander	236 522

Among the other products of the soil exported, mention should further be made of: olive oil, 402 000 francs in 1909; and gum Arabic and sandarac, the total exports of which amounted to 823 328 francs in 1909.

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(1) 25.225 fr. = £1.

468 JUMELLE. **Notes on Agriculture and Forestry in Madagascar.** (Rapports sur l'Agriculture et les Forêts). — *Revue de Madagascar* Nos. 9-12 pp. 979-987 and 1026-1027. Paris, Décembre 1911.

Madagascar

There is no doubt a great future in store for agriculture in Madagascar, in spite of its having hitherto made little headway there, owing, chiefly, to the difficulty of making uniform experiments in a region of such vast extent and such varied climate.

Whilst in 1901 the Colony imported 26 000 tons of rice, the present local production exceeds the demand for home consumption, and opens up the way for exportation, which in 1909 amounted to 4000 tons. Silk-growing is progressing rapidly, mainly owing to the activity of the Nanisana Station. In 1904 only 9 tons of vanilla were exported, while this amount increased to 44 tons in 1909. The culture of both coffee and cocoa started on the East coast is highly promising. Excellent results in ostrich-rearing have also been obtained in the South-West of the island.

On the other hand, crop experiments made in the North and North-West, have not been crowned with success, except in the case of the cocoanut palm. The small settlements of the Centre of the Island have not generally been a success; the larger ones more so from the point of view of utilising the natural products of the soil than from the fact of having started any real agricultural enterprise.

Different kinds of crops must be developed in different regions, *e. g.* cotton in the North and North-East ; rubber in Baina, in Sambirano and on the East coast ; rice in the Centre ; and manioc, vanilla, coffee and sugar-cane in other parts. Cattle must be better fed for exporting to France, either as live animals or in the form of frozen meat.

It is of the utmost importance for the future development of agriculture in Madagascar, especially in the case of rice fields, that the country should be thoroughly irrigated. Some steps in that direction have been already taken in the plains of Betsimitatatra, Marovoay and Vakinankaratra.

In order to promote success in rice-growing, it would be advisable to form a special committee to find out the most urgent improvements to be undertaken in harvesting and storing the rice. Besides this, efforts should be made to spread the culture of cotton over the small native estates in the North and North-West. Experiments should also be continued in acclimatising foreign rubbers in the East and in Lambirano ; while it would be well to have plantations of young native rubber in the North-West. Having once for all made sure of an outlet for the exportation of cattle, encouragement should be given to rearing them on the extensive pasture-lands in the interior of the western mountain-chain.

The colonisation committee must study the question of making sure of a means of feeding cattle during the dry season, by introducing either tuberous forage-plants or hay.

The forests of Madagascar cover an area of about 9 millions of ha. (over 22 million acres), *i.e.* about a sixth of the area of the whole island. They constitute a very considerable source of wealth, which is hardly turned to any account owing to the unfavourable condition of the surrounding country.

At the same time there is a growing impulse in favour of the export of timber etc. In 1896 only 1 401 188 francs (1) worth of timber and other forest produce was exported. In 1909 this sum was increased to 12 422 900 francs, *i.e.* 55 % of the total export trade of the colony, gold not included.

Between 1909 and 1910 the value of the export trade of Madagascar rose from 33 378 179 to 45 438 280 francs. The chief exports in 1910 were:

Rubber	frs	9 366 922
Skins	»	9 506 530
Rafià	»	2 859 000
Tan-bark	»	2 734 000
Lard	»	1 161 000
Dried Vegetables	»	1 160 000
Rice	Tons (English)	8 120
Salt Meat	frs.	895 000
Oxen	Head of	12 648
Manioc	Tons (English)	4 580

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY.

Occupations of Agricultural Students after leaving College. — *Th Journal of the Board of Agriculture*, No. 10, pp. 848-850. London, January 1912. **464**

United Kingdom

Questions are sometimes asked as to the parentage of the agricultural student, and as to what becomes of the student himself.

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(1) 25.225 francs = £1 at par.

The Institutions were asked to supply information showing the occupation of the parents of those pupils who left during the past three years, and the occupation which the pupils themselves now follow.

The institutions have been arranged in three groups. A summary of the returns is given below :

Institutions	Total number of students leaving	Occupation of Parents			Occupation of Students		
		Farmers	Land Owners	Others	Farmers	Land Owners	Others
Agricultural Colleges.	1 064	469	160	435	843	161	60
University Colleges and other Institutions.	384	279	7	98	310	21	53
Farm Schools.	321	221	6	94	294	2	25
Total.	1 769	969	173	627	1 447	184	138

Of 1769 pupils for whom full particulars are available, it will be seen that 1631 are known to have returned to occupations connected with the land, and the great majority are engaged in farming. The « others » number 138, and include a good many who have been lost sight of and may have taken to agriculture. As regards parentage, it will be observed that 969 were the sons or daughters of farmers, and a further 173 were connected with the land. It will be remarked that the largest proportion of pupils of non-agricultural origin is to be found in the first group of agricultural colleges shown above, the reason being that residential colleges in the country, with farms attached, are always preferred by non-agriculturists who wish to secure an agricultural training for their children.

In the past three years 231 students have attended the classes provided by the Agricultural Department of the University of Cambridge :

Of these 59 are engaged in teaching or research, or are employed in supervising agricultural work in other countries, 29 are landowners or expect to inherit land, 17 are engaged in, or are preparing for, land agency work, 13 are farming. The occupations of the remainder are unknown, but it is probable that many of them expect to inherit land or to become associated with land management.

The John Innes Horticultural Institute. — *Morning Post.* London, Dec. 29, 1911. **465**

England

The work of the John Innes Horticultural Institute (at Merton, Surrey) includes the provision of investigations and researches of a practical and scientific nature, in connection with the problems of horticulture, the imparting of practical and scientific knowledge, the practice of scientific planting, and breeding, and the creation and introduction of new varieties.

An accurate knowledge of heredity must form the basis of the bulk of new work in horticultural breeding, therefore the main line of research that is being pursued is of fundamental importance to farmers.

Accepting the principles laid down by Mendel as underlying the most complex problems of heredity, the Director of the John Innes Institute and his staff are attempting an analysis of the germ cell and are striving to find the laws which govern the behaviour of the various factors by which the germ cell is influenced.

The Institute has at its disposal eight acres of land, to which two others are shortly to be added.

There are three green-houses available for the work of the Institute in the Directors' garden, and three span-roof glass-houses with a corridor in the grounds.

One of these houses is fitted with special insect-proof cages. A fourth is being equipped with a special system of ventilation, in order to make the house insect-proof.

This house is designed for work with fruit trees.

An ingenious arrangement has been devised for safe-guarding experimental crops from the attacks of birds. It consists of independent wire screens attached to a frame-work of iron, and is so contrived that its constituent parts can be combined to protect plots of various sizes.

Attached to the Institute are two small laboratories, one for chemical and the other for biological work, a photographic room being also included.

There is a small enclosure divided into pens for the experimental breeding of fowls, in which the same class of experimental work that is being conducted at Cambridge is being carried on, and there is a special room devoted to the breeding of canaries.

Important work is being done on such immediately important questions as fumigation, and on a problem of vital interest to the fruit-grower—self-sterility in plums. Interesting points in connection with this phenomenon have already been determined by Mr. W. O. Backhouse, and the subject is still under investigation.

Experiments are also in progess dealing with the crossing o different varieties of plants and shrubs and with the causes of bolting or running to seed in root and other crops, as well as with the question of sex-inheritance in fowls.

466 ZANDER, Prof. Dr. ENOCH. **The Royal Bavarian Bee-keeping Institute at Erlangen.** (Die Königlich Bayerische Anstalt für Bienenzucht in Erlangen). — *Die Bienenpflege*, 34. Jahrgang, Heft 1, pp. 14-19. Weinsberg, Januar 1912.

ermany

In 1907 an Institute for Bee-keeping was annexed to the Zoological Institute of the University of Erlangen. The Institute possesses a spacious Laboratory with excellent apparatus for zoological and bacteriological studies and a heated glass house 9 metres (30 ft.) in length, 4 in width and 5 in height, covered with dull glass; in this house studies in bee colonies are carried out during winter. In the garden of the Institute the most important bee-feeding plants and a number of bee colonies in hives of every known system are to be seen.

A Museum of bee-keeping economy, a workshop, and hives that are moved from place to place outside Erlangen, complete the institution.

The principal, Professor Dr. Zander, gives courses of lectures of varying lengths on bee-keeping every year; resident pupils are also admitted for a length of time. The scientific work of the institution has hitherto been concerned with enquiries into bee diseases, honey formation, and the building work and life of the bee.

467 **The Norwegian Ministry of Agriculture and Agricultural Schools and Institutes** (1).

Norway

The Norwegian Ministry of Agriculture was founded in 1899 and commenced its activities in 1900. It is composed of three divisions: agriculture, forestry and veterinary. The administration is in the hands of the Minister and his cabinet.

The division of agriculture has the following staff: director general, agricultural adviser, secretaries and clerks, agricultural adviser n England, chemists, official entomologist, agricultural engineers and their assistants, official advisers for live-stock improvement, nspector and advisers for dairying, directors of sheep-breeding stations, directors of land-registry, inspector of fisheries.

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(1) From a communication submitted by the Special Correspondent at Christiania of the International Institute of Agriculture.

The agricultural chemists have charge of the government Stations for Agricultural Chemistry, and undertake all investigations dealing with agriculture. Farmers may have analyses of waters, soils and substances for improving the soil made free; analyses of chemical manures and feeding-stuffs are also made free for purchasers of certain quantities.

The official entomologist supplies free to farmers information on insect pests and diseases of plants and on means for their control.

The agricultural engineers and their assistants give advice as to construction of buildings, with plans and estimates if required, and information on water-power and drainage.

The advisers for live-stock improvement direct all the State Institutions for this purpose, arrange official shows, control the service stations for horses and cattle, and undertake the purchase of breeding-stock when the State makes grants for the purpose.

The dairy advisers, besides supervising the State dairies, look after the setting-up of new co-operative dairies and their rules.

The inspector of fresh-water fisheries supervises salmon and other fishing and the application of laws on the subject.

The central forestry administration includes management of all the State forests, of the public Schools of Forestry, and of nurseries for forest trees, including those receiving State subsidies. The staff includes: an expert and assistants for estimating timber, an inspector, regional forest officers, regional assistants, and planting specialists. Further, two regional officers have charge of the State moors in Finmark.

At the head of the civil veterinary service is the director of veterinary medicine, with charge of all the civil veterinary services and meat-inspection services ; these are : licensing, adoption of public measures for checking the spread of contagious diseases of stock, preparation of regulations and plans for veterinary administration, importation and exportation of animals and their control, preparation of veterinary statistics, control of public slaughter-houses and cattle-markets and of communal institutions dealing with the veterinary service. To the above veterinary service is annexed one of veterinary pathology.

There are further a certain number of regional officials more or less directly attached to the agricultural department (at present 35

In most instances these prejudices and obstacles have been surmounted and while there were but five school gardens at the end of 1901, to-day there are 240.

Numerically, therefore, the scheme may be said to have made satisfactory progress, but it would be more to the point to inquire if the school gardens are serving their purpose.

Their aims, as set forth in a Circular, are indicated below, and under each is appended a note to indicate the progress made:

1. To brighten the surroundings of the school and make it a pleasant resort for the boys and not a bare and unattractive building.

The changes that have taken place in the surroundings of the chosen schools have been very striking and the grounds attached to schools serve to make them very much more attractive than they have hitherto been.

2. To lighten the routine of class work by varying it with outdoor work of a recreative nature.

Where the initial prejudice against manual labour has once been overcome, the value of school gardens, in providing recreative work for the boys, will be readily admitted by any one who visits a school during gardening hours and sees the heartiness with which the children set out their work.

3. To exemplify order, form, method, and good taste in the laying out of the premises. These qualities are well illustrated at a large number of gardens.

4. To furnish a field for nature study.

In a few schools the teachers have established miniature museums, containing interesting specimens of natural objects, vegetable, mineral and animal, gathered by the children themselves.

5. To serve as an object lesson in horticulture. The gardens answer this purpose admirably. The systematic cultivation of both ornamental and economic plants, supplied by the Stock Garden, is supervised by travelling assistants who are trained horticulturists.

6. To supply a practical side to school life and a training in elementary agricultural science.

Regular and systematic instruction has yet to be provided, and steps are likely to be taken at an early date to meet this requirement.

7. To act as a medium for bringing improved and new varieties of cultivated plants to the notice of the village population.

Superior varieties of existing vegetables and fruits, as well as new kinds, are continually being brought to the notice of the village cultivator through the gardens, and new cultivations are often traceable to their influence.

8. To serve as centres for the dissemination of seeds and plants, and of information concerning them.

Propagating media are freely given away to school boys, and applications from villages are frequent. The work of seed dissemination is thus going on at every established school garden.

9. To be a medium of communication between the agencies that work for agricultural improvement and the cultivating classes.

In this connection the Ceylon Agricultural Society, which is greatly interested in school gardening, has done much.

10. To induce the villager directly, or through the school boys, to adopt better methods of cultivation.

This work must necessarily be of slow progress, and though at this stage it is too soon to expect any striking results, there is a tendency for the methods adopted in school gardens to be taken up in the villages.

11. To give to the village youth a bent for agriculture, and reconcile him to a country life.

A system which combines practical horticulture with class studies must, as a matter of course, counteract any tendency for book-learning to take the village youth away from the land.

12. To encourage school boys to establish gardens in their homes.

A large number of home gardens have already sprung up in connection with school gardens.

The work on the gardens is encouraged by the offer of awards to the best work.

JOHNSON, A. A. **County Schools of Agriculture and Domestic Economy in Wisconsin.** — *U. S. Dept. of Agric., Office of Experiment Stations, Bulletin* 242. Washington, 1911. **469**

United States: Wisconsin

Probably no movement in education has received as much attention in the past few years as has that which pertains to the practical phases of farming and home making. The importance of this movement can easily be seen when consideration is given to the decreasing fertility of agricultural lands in the United States during the last 20 years and the relative decrease in farming population. From recent investigations it was found that probably 60 million people live in cities and 31 million remain on the farm, when only a few years ago the bulk of the population resided in the farming districts.

Formerly practically all the food and much of the clothing used by the farmer and his family were produced in the home, the homes themselves being built with trees from the neighbouring forests. Now these conditions have changed and the realization of the educational loss occasioned by the transfer of these domestic industries to factories in cities, and the growing need of something to take their place in the educational system, has brought about the establishment of practical schools of agriculture and domestic economy.

Of the more firmly established schools of this nature may be mentioned the Congressional District Agricultural Schools of Georgia and Alabama; the Judicial District Agricultural Schools of Oklahoma; the four District Agricultural Schools of Arkansas; the Agricultural High Schools of California, Minnesota, and New-York; and the County Agricultural Schools of Wisconsin and Michigan. All these schools have one common object, that of dignifying farm labor and teaching boys and girls the industries which are now so rapidly vanishing in the rural homes of America.

Wisconsin was the first State in the Union to organize a county school of agriculture and domestic economy. The following 5 schools have been established since 1901, Wansau, Menominee, Winneconne, Mariette and Onalaska.

These county schools are, strictly speaking, agricultural trade schools and have for their sole object the educating of the farmers' boys and girls who do not wish to take up an extensive college course, but who are anxious to get that form of training which will be most useful to them when they take charge of the home farm.

The school is made the educational center of the community, and the farmers are free to call upon it for assistance in any line of work pertaining to farming and home making.

Being of the trade school type, these schools do not prepare students for the State University or the College of Agriculture.

The course of study covers a period of two years of eight months each.

Each school receives support from the State amounting to $ 4 000 a year.

All schools require for entrance that students shall have completed work equal to the eigth grade, admitting also students from outside of their respective counties.

Institutes of various kinds are conducted at each of these schools.

The following are some ways in which these schools help the farmers :

Prepare plans for farm buildings.

Make suggestions for remodeling old buildings.

Build forms and supervise the construction of cement silos, watering troughs, and similar structures.

Test all kinds of dairy products.

Assist in the selecting of farm animals.

Plan drainage systems.

Test farm seeds for germination.

Test cattle for tuberculosis.

Test soils.

Recommend systems of rotation.

Twenty-four silos of solid concrete were created in various parts of Dunn County during 1909 under the supervision of the school of Menominee.

The total enrolment for the year 1910-11 in these county schools has been about 400 students.

From present indications, Milwaukee County will probably have one of the largest and best-equipped schools of agriculture and domestic economy in the country. The county has purchased 400 acres of land, costing $ 110 000 for a school site and farm. Plans have also been completed for the erection of buildings costing approximately $ 200 000.

The La Crosse County School at Onalaska has the following courses for agriculture and domestic science.

AGRICULTURAL COURSE.

Junior year.

Fall term: dairy husbandry; farm arithmetic; carpentry; breeds of farm animals; stock judging; physics; military drill; physical training.

Winter term: dairy sanitation and testing cattle for tuberculosis; English; farm arithmetic; carpentry; physical training; breeds of farm animals; stock judging; physics; military drill.

Spring term: farm botany; drainage and road construction; farm machinery, including gas engines and steam traction engines; English; civics; poultry, with use of incubators; military drill; physical training.

Senior year.

Fall term: soil physics; forge work· animal breeding; chemistry; English; military drill; physical training.

Winter term: soil physics; forge work; chemistry; mechanical drawing; blue-print making; English; military drill; physical training.
Spring term: orcharding and spraying; feeding farm animals; field crops; birds and insects; farm management; concrete construction; military drill; physical training.

DOMESTIC SCIENCE COURSE.

Junior year.

Fall term: cooking; sewing; food study; English; home arithmetic; physical culture.
Winter term: cooking; sewing; food study; English; home arithmetic; physical training.
Spring term: cooking; sewing; English; laundering; hat trimming; floriculture and vegetable gardening; physical culture.

Senior year.

Fall term: cooking; sewing; English; household management; physical culture.
Winter term: cooking; sewing; English; care of the sick, and emergencies; physical culture.
Spring term: cooking; sewing; woodwork; household art; physical culture.

AGRICULTURAL SHOWS AND CONGRESSES.

470 PERROT. **Colonial Exhibition and Lectures, in Holland in 1912.** (Enseignement colonial et exposition coloniale en Hollande en 1912). — *La Quinzaine Coloniale,* No. 1, p. 2. Paris, 10 Janvier 1912.

Netherlands

At the present moment Holland is greatly interested in colonial instruction, not only in the colonies themselves but also in the mother country. It has therefore been decided to found an Institute at Daventer for the purpose of training colonial planters. A colonial exhibition of agriculture will be opened there in 1912, during the course of which lectures will be given on Colonial Agriculture and Economics.

International Exhibition of Rice-Growing and Irrigation. — *Il Giornale di Risicoltura,* Anno II. No. 2, p. 18. Vercelli, 15 Gennaio 1912. 471

Italy

An International Exhibition of Rice-growing and Irrigation, as well as the IVth International Rice-growing Congress, will be held at Vercelli, in the province of Novara, Italy, during October and November, 1912.

MATENAERS, F. F. **Competitive Trial of Modern American Farm Tractors at Winnipeg, Canada, in the Autumn of 1911.** (Prüfung und Wettbewerb moderner amerikanischer Farm-Traktoren bei Winipeg im Canada in Herbst 1911). — *Deutsche Landwirtschaftliche Presse,* 39. Jahrgang, No. 5, pp. 41-42. Berlin, 17. Januar 1911. 472

Canada

During last autumn a ploughing competition with tractor engines was held at Winnipeg in Canada. 30 different types of engines took part, working with gasoline, petroleum or steam. During the first week of the trial the serviceableness of the machines as a stationary source of power for shafting work was tested. In the second week the ploughing competition proper was held on a tough prairie soil which had never been previously ploughed.

The costs of fuel per acre in the case of gasoline engines range from 23.5 cents in the cheapest engine to 74.2 cents in the dearest. The price taken for gasoline is 15 cents per gallon.

With the petroleum machines the lower limit of fuel cost per acre was 28 cents and the upper limit 46.8 cents, reckoning 1 gallon of petroleum at 12 cents. Therefore the difference was very much smaller than between the different gasoline engines.

The working capacity per hour was in four instances more than 2 ½ acres; two machines ploughed less than 1 acre per hour; the remainder were between these two extremes in their output.

Generally the work of the machines was satisfactory in a high degree.

Fourth National Congress of the Agents for Eggs, Poultry, Game, etc. at Moissac, Tarn-et-Garonne, France. 2nd and 3rd March 1912. (4e Congrès national des Expediteurs d'Oeuf, Volaille, Gibier, etc, à Moissac). — *Revue d'Aviculture technique et commerciale,* 4e année, No. 31, pp. 1-2. Paris, Janvier, 1912. 473

France

This Congress, organised by the Federation of the French agents for eggs, poultry and game with the co-operation of the Agents'

Syndicate of the Tarn-et-Garonne and adjacent Departments, will be held at Moissac on March 2nd and 3rd 1912.

The following are the matters to be dealt with by the Congress: the law of 1896, and central markets; the town-dues, their reimbursement on leaving the town, or their total suppression; high cost of living; questions of transport.

CROPS AND CULTIVATION

AGRICULTURAL METEOROLOGY.

474 BROUNOR, P. I. **Weather Forecasting.** (Stranitcka is Nieistrumentalnikh Meteorologhiceskikh Nablindenii). — *Xurnal Opětnoi Agronomii.* — (Review of Experimental Agriculture). G. XII, Kniga 6, pp. 924-925; S. Peterburg, Dekabr. 1911.

Russia

This is an interesting contribution to the study of weather forecasting, based on direct observation of meteorological phenomena, without the use of special instruments. The writer is convinced that mirages, fogs, and halos round the planets, may announce a distinct type of weather, and he explains this relation by the data supplied by synoptic charts, reinforced by numerous personal observations.

Thus the dense fogs that come from the sea he considers to be a sign of lasting fine weather. They owe their origin to, and are driven by, the hot winds, which as they blow towards the cold coasts, bring about a sharp temperature gradient, and are the certain indication of the approach of an anticyclone.

The mirages noticed along the bay of Hungerberg precede bad weather, but always with an interval of one or two fine days. The formation of mirages is clearly explained by the study of synoptic charts· (1) to the south of Hungerberg there occurs an area of minimum pressure (cyclone); (2) the water temperature in the Gulf of Finland is rather high; (3) the cyclone proceeding towards the north and constantly approaching the Bay of Hungerburg (on the Gulf of Finland) attracts in that direction the cold winds from the north-east, and when the cyclonic area lies in the immediate neighbourhood of Hungerburg, the north-east air currents pass over the eastern extremity of the Gulf of Finland, and the great difference of temperature between the water and the atmosphere brings about the well-known phenomena of abnormal refraction.

The golden sunsets, the alto-cumuli which make the sky look like marble, and appear to increase its depth, are signs of the approach of maximum pressures, and hence of lasting fine weather. The rose-coloured clouds with silver edges, and the large luminous rings round the sun indicate the same.

Halos as a rule are signs of bad weather, because they mean cold atmospheric strata not very high up, — a state of things which during the summer takes place in cyclonic areas.

KLEIN, P. **A New Service of Agricultural Meteorology in France.** (Un Nouveau Service de Météorologie Agricole). — *La Vie agricole et rurale*, No. 7, pp. 169-170. Paris, 13 Janvier 1912. **475**

A new service of agricultural meteorology will shortly be established in France.

THE PRESENT METEOROLOGICAL SERVICE.

France

The projected service will collaborate with the general meteorological service established in 1885 on the initiative of the astronomer Leverrier. The latter includes a central office in Paris, and stations in all parts of France. Every day the central office receives telegrams both from the French, and from foreign, stations. From the information received a chart is prepared which shows the distribution of the different atmospheric elements, and from this a relative forecast of the weather is drawn up. In order to facilitate the forecast, France has been divided into eight districts; north-west, north, north-east, west, central, east, south-west, south; for each of which a special forecast is made.

But this division into eight districts is not sufficient, because the features of the land may cause very different weather in neighbouring places: hence they can only supply indications of a very general kind. The forecasts made for twenty-four hours are sent by telegram both to individuals and to societies; they are also published in the daily papers, but the time required for this prevents the forecast reaching the public in time to be of much use. There is also a service of climatology connected with the Central Office. Its work is to collect and publish periodically all the data (atmospheric pressure, temperature of the air, etc.) connected with general climatology.

But the Central Office in not all. In certain districts, namely, Cadillac, Carcassonne, Châlons-sur-Marne, Clermont-Ferrand, Condom, Montpellier, Narbonne, Perpignan, there exist secondary services of agricultural meteorology, due to private initiative. These receive from the Central Office the weather forecasts, deduce the probable consequences as bearing on the crops, etc., and communicate the same to their subscribers.

ORGANISATION OF THE NEW SERVICE.

The new service will be directed by a Committee, assisted by technical experts. They will determine the observations to be made, and collect and work out the data.

The mass of materials thus brought together will make it possible to determine precisely the influence, as yet little known, of the different atmospheric forces, and hence deduce the agricultural *modus operandi* most suited to the different meteorological situations.

DISTRICT STATIONS.

These stations will be established in the centre of districts characterised by the similarity of their atmospheric conditions, and will, as far as possible, be attached to observatories, schools of agriculture, etc., already existing.

For this purpose it is probable that the following places will be selected: Bagnères-de-Bigorre, Besançon, Bordeaux, Clermont-Ferrand, Dijon, Lille, Lyon, Marseille, Montpellier, Mount Aigonal, Nancy, Nantes, Poitiers, Perpignan, Rennes, and Toulouse. They will receive by telegram every day about noon from the Central Office a somewhat detailed account of the actual state of the atmosphere for the whole of the Continent and the probable course of the weather. By means of this information, and with due regard to local conditions, they will each draw up a special forecast for their own district, which will then be transmitted to the secondary stations dependent on them.

STATIONS OF INFORMATION AND WARNING.

These stations will be as numerous as possible and stand in direct relation with the country people. They will be directed by agricultural professors or instructors, who as soon as they have received information from the district stations to which they belong, will transmit the same to the farmers in the form of clear and practical advice. They will give warning of unexpected events (*e. g.*, the approach of a storm, or of frost) with the use of all available means, such as placards, optical signals, drums, and trumpets. Those farmers who wish will receive by telegram these warnings for a small charge.

AGRICULTURAL POSTS.

These posts will be attached both to the district stations and to the stations of information. They will be provided with all the instruments required for making daily observations in agricultural, as well as in pure meteorology. These observations will be sent, the former to the technical Service, and the latter to the Central Bureau, to be used for drawing up the charts.

The new service will include such a large number of stations that the whole country will benefit from the information collected. It is obvious that the whole organisation can only be carried out progressively, but when once completely established, the timely information and warning which it will afford cannot fail to be of the highest use.

XARISOMENOV, C. **The Influence of Rain and of Atmospheric Temperature on the Cereal Crops in the Governments of Saratov, Samara and Tambov.** (Vliianie Osadkov i Temperaturi Potevina Wroxai Khliebor Sarat-Samarskoi i Tambowskoi Gub. — *Jurnal Opetnoi Agronomii* (Review of Experimental Agriculture). G. XII, pp. 927-928. S. Peterburg, 1911. **476**

Russia

· The author draws many interesting conclusions from a comparative study of the year-books of the Central Physical Observatory and of the statistics of the Department of Agriculture respecting the influence of meteorological conditions on the quantity and quality of the harvests.

The data used were collected during a period of 25 years and deal with the cultivation of cereals, forage plants, and potatoes from the point of view of the effect of rain and the temperature of the atmosphere.

The following are some important conclusions :

Increase of rain in winter is accompanied by a parallel increase in the crops ; abundant rainfall in November, December, January, February and March are beneficial to all cereals, but heavy rains in April are on the contrary very injurious to them.

Increased rainfall in August, September, October, and April causes a decrease in the crops of spring cereals, while winter cereals and perennial forage plants are not harmed.

The explanation of the good and bad effect of rain must be sought for in pedology and in vegetable physiology.

The effect of capillary action is the principal cause of the damage wrought by rain. A detailed description is given of the movements of water in the soil during the different seasons of the year.

In the district of Saratov, as the temperature is below the optimum in autumn and winter, and above in June and July, it follows that during both these seasons the nitrification processes are retarded and hindered.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY.

477 **Agrogeological Map-Making.** BJÖRLYKKE, K. O. Über agrogeologische Kartierung. — *Verhandlungen der Zweiten Agrogeologenkonferenz*, pp. 290-298. Stockholm, 1911.

BLANCK, E. Über die Bedeutung der Bodenkarten für Bodenkunde und Landwirtschaft. — *Fühlings Landwirtschaftliche Zeitung*, 60. Jahrgang, Heft 4, pp. 121-145. Berlin, 1911.

HALL, A. D. and RUSSELL, E. J. Soil Surveys and Soil Analyses. — *The Journal of Agricultural Science*, Vol. IV, Part 2, pp. 182-223. Cambridge, 1911.

Sweden, Germany, England

The most important preliminary to agrogeological map-making is the clear definition of the limits of agrogeology and of geology proper.

What is the distinction between an agrogeological and a geological map? The present condition of pedology permits of more than one clear definite reply to these questions, which place the problem in its proper light.

The scope of the ordinary geological map is the definition and limitation of the formations as a whole, little stress being laid upon the facies in the different localities.

In soil maps, on the contrary, the facies are the most important, since the value of the various soils, from the agricultural point of view, depends upon their petrographical composition.

As an example of this may be mentioned the delta-formations, which although geologically of similar origin, yet present a great variety of soils from an agricultural stand point. Further, while the geological map has chiefly to do with the subsoil (the result of the disintegration of the rock-floor) the agrogeological map concerns itself chiefly with the superficial layer, which, as a result of weathering and decomposition, forms a suitable stratum for plant-growth. A third difference is, that the geologist studies the various formations from the point of view of the time and mode of their occurrence, while the agrogeologist is only concerned with the agricultural value of the soil and the manner in which it can be turned to the best practical use at the present time.

Thus, while on the one hand, agrogeology or pedology is an independent science but closely related to geology, on the other, it is an applied science, whose aim is to make clear the relation between the inorganic an . the organic world -- and especially to explain the relation between cultivated soils and the plants grown upon them.

But for this, we must go back to nature, types of soils must be studied in the field, not in the chemical laboratory, their differences must be distinguished and their properties understood.

Amongst the various methods of agrogeological map-making adopted in different lands, the best is in all probability the one adopted by the United States Division of Soils.

According to this method, not only are the different soil types distinguished upon the map, but notes are added in which the different kinds of soil are considered in relation to their adaptibility to the agricultural needs of the districts in question

The description of the soil of a district should comprise :

1. A geographical and orographical review.

2. A review of the climatic conditions.

3. A summary of the conditions of agriculture and of the allied branches of industry in the district.

4. A geological map of the district.

5. A more detailed description of the different soil types, their physical and chemical properties, and their relation to cultivated plants or to the vegetation of the district in general.

6. A review of the future possibilities of agriculture in the district, with regard also to the areas which are capable of cultivation, though at present untilled.

The chief difficulty in such researches is the determination of the different types of soil. Upon what should such distinctions be based? It should be noted that climatic divisions, though of geographical interest, have in practice a very limited utility. It is necessary for the pedologist to distinguish between the most important soil types in limited districts where the climatic conditions are comparatively uniform.

Therefore the most important basis of classification is the physical property of the soil which depends chiefly upon mechanical composition, which is partly the result of its geological origin, although other factors must be included, *viz.* chemical composition, topographical and geotechnical conditions.

From the topographical point of view, different types of soil can be distinguished : terraces, lacustrine deposits, etc. The chemical composition often has considerable influence upon vegetation.

Soil rich in humus can be divided into types according to the plants from which the peat is formed, the stage of their decomposition. Mechanical analysis is however of supreme importance in the classification and characterization of the types of mineral soils.

The first aim therefore is to distinguish the different kinds or types of soil which occur in nature, and to explain their occurrence from their situation and by the help of sections. Samples must be taken both of the subsoil and of the soil, and submitted to chemical and mechanical analysis in the laboratory.

The above mentioned method of mapping and describing the soil types of limited areas is of course only preliminary work. When this has been done for the different districts, it will be possible to make a survey map of the whole district, coordinating the information collected with the climatic and meteorological factors.

The recent pedological researches tend to render the science of agrogeology more complete, and make soil maps more exact and richer in details.

The American workers have devoted themselves with much zeal to what may be called the study of the physical types of soil. Their researches however need much time, being based upon the average results of experiments lasting many years.

The study of the microorganisms of the soil will probably yield important information respecting the different types, but this study has so far made little advance. Pedology is still in its infancy, many important questions still await an answer.

Conditions are naturally not the same in different countries.

There are some countries where it is possible now to begin with a physiological examination of the different soil types — the climatic and petrographic conditions being so clearly defined and uniform, but in countries like Norway the petrographical and climatic conditions are so varied, that the preparation of a survey map will be a long and laborious task, although Norway's division into districts is helpful.

Norway is divided into 18 districts, nearly all of which have their own agricultural school and separate agricultural officials. A partly private society has formed a Central Committee for soil research.

This Committee consists of the Agricultural Professors of the Agricultural High School and has elected as their third member a practical agriculturist.

The material collected by various collaborators (Professors of Agriculture, etc.) is submitted to the Central Committee and published.

These soil descriptions are only preliminary work, but it is hoped that they will afford the necessary data for the drawing up, in the future, of agricultural and descriptive maps of the whole country.

The agrogeological maps might be divided into two divisions:

1) Agrogeological survey maps (general).
2) Detailed Agrogeological maps.

The general survey maps can be divided into:

a) District maps.
b) Regional maps.

In drawing up the scheme of work, it is best to begin on a small scale with districts and communes, afterwards proceeding to the construction of a general descriptive map of the whole country, or a large part of it, adopting an international scheme of colours and terms.

DE MIKLASZEWSKI, SLAVOMIR. **Types of Soil and their Importance.** — *Verhandlungen der Zweiten Internationalen Agrogeologen Konferenz*, pp. 276-278. Stockholm, 1911. **478**

In the classification of the different types of soil, the Russian agrogeologists subordinate all pedological principles to the single one of climate.

Russia : Poland

But there are many cases which cannot be explained from the point of climate alone.

The climatic factor does not account for the fact that sterile and poor zones alternate with fertile and rich zones where the climate and geological formation are the same, although it is the most important when vast, but geologically homogeneous, regions are the subject of study, as it affords a method of explaining all the differences between the various geographical groups of the soils under examination.

But as soon as it is a case of the description of less extensive regions, in which often many geological formations are represented, we find ourselves confronted by questions which cannot be answered by reference to climate alone.

This is almost always the difficulty which the pedologists encounter in districts rich in geological formations, but too restricted in extent to have much variation in their climate. The same difficulty will also arise in the case of more extensive and uniform regions when, having traced ont the climatic zones, it is necessary to elaborate a more detailed classification. It is the latter alone which is of importance from the agricultural point of view.

It is necessary to establish agricultural types, types of soil, that is to say, which although uniform from the climatic standpoint are, nevertheless, variable from the point of view of cultivation.

Many natural factors take part in the formation of a soil, and the typical pedological characters are those which are determined by the dominant factors.

In those zones which do not consist of types of soil, but of groups of typical soils, climate doubtless is the dominant factor; it is rarely so, however, where the formations are varied.

Thus, in the case of the soil group known as *rendzina*, we have in the cretaceous soil three different types, black, white, and yellow, which are similar from the climatic and geological point of view (being derived from the marl and limestone of a single formation) but which vary much and are of very different value as the constituents of arable land.

Therefore, in all pedological research, it should be borne in mind:

1. The different types of soil have typical pedological characters due to dominant factors, (differing in the case of each; and which it is always necessary to determine, although very often climate is the dominant factor.

2. In the case of the unequal fertility of two apparently similar types, it should be suspected that the right dominant factor has not been discovered, for there are many natural factors of which we know little, or even nothing.

3. All types of soil, however determined, require special me-

thods of examination and, being different, should be investigated separately.

4. The results of physical or chemical experiments, although obtained by the same methods, can only be compared in the case of the same types of soils.

479 TOLSKII, A. P. **Observations on the Penetration of Heat in the Soil in Busulusk, Government of Samara, Russia.** (Is Nabliudenii nad Temperaturoi Pocvi v Busulkskom Born Samarskoi Gub). — *Jurnal Opetnoi Agronomii* (Review of Experimental Agriculture) G. XII, Kniga 6, pp. 919-920. S. Peterburg, 1911.

Russia

This article gives the results of numerous experiments made by the writer at the meteorological station of the experimental forest of Borov, upon the distribution of temperature in the soil in relation to the flora, the relief, the working and qualities of the soil, the snow covering, etc.

During winter, the soil is warmer in the woods than in open districts, in fact, the layer of frozen soil has, in the first case, a thickness of one metre (3 ft. 2 in.) and in the second, attains a depth of 1.50 metres (5 ft.).

In summer, on the contrary, the reverse is the case, and the maximum difference in temperature may be 5°C. (9° F.) in exposed soils. A covering of snow has a wonderful effect upon the freezing of the soil: for while the frozen stratum may be 2 metres (6 ft. 6 in.) deep in uncovered places, it generally does not exceed 1 metre (3 ft. 3 in.) where there is a covering of snow.

As for the influence of relief, it has been proved that the summits of the dunes part with their heat and regain it more quickly than do the slopes and the valleys between them.

Working the soil has a direct influence upon the temperature: soil dug or ploughed acquires much more heat than ground which has been left fallow. If the latter is denuded of turf the relation changes, showing that the lowering of temperature in the former case is due to the grassy covering.

480 CZERMAK, W. **Modification of the Pysical Properties of the Soil under the Action of Frost, Heat, and certain Salts.** (Ein Beitrag zur Erkenntnis der Veränderungen der sog. physikalischen Bodeneigenschaften durch Frost, Hitze, und die Beigabe einiger Salze). — *Die Landwirtschaftlichen Versuchs-Stationen,* Bd. LXXVI, H. I and II, pp. 75-116. Berlin, 1911.

Germany

The modifications of the physical properties of the soil have an important bearing on its structure and on its capacity for absorbing and accumulating nutritive matter for plants; for these modifications may set up conditions favourable to the life and growth of the roots.

Under the soil's physical properties the writer chiefly considers from this point of view its tenacity and its capacity for absorbing water.

These properties, as Mitscherlich (1) has shown, are closely connected with the surface of the soil, *i.e.*, with the sum of the surfaces of its particles; and as this surface is in its turn connected with the soil's hygroscopicity, the determination of the latter gives an idea of the two above-mentioned properties. In order to determine the hygroscopicity in his experiments the writer used the method of Rodewald and Mitscherlich (2), only modifying it so far as to secure a perfect desiccation of the material examined. Mr. Czermak also determined the amount of soluble nitrogen in differently treated soils, and proceeded to experiment with plants in pots, using oats.

Experiments were made on the action of cold by means of a refrigerating apparatus at a mean daily temperature of from 4° to 6° C. (39.2° to 42.8° Fahr), during 4 to 8 weeks. The action of heat as effecting sterilisation was tested twice, for two hours, at a pressure of from 1.5 to 2.5 atmospheres. The salts experimented with were calcium chloride and aluminium sulphate and in the plant experiments, calcium chloride and thorium chloride.

In the latter experiments an electric current of 0.025 amperes was employed, in order to prove the possible electrolytic action of the salts used as electrolytes. The soil chosen for these researches was a tenacious loam.

The following considerations, which are of general practical importance, may be deduced from the results obtained.

1. As regards the action of cold or of frost (the importance of which every farmer well knows, without any experimental or scientific study of the phenomenon), it induces a shrinkage of the soil surface through the coagulation of the colloids. Its duration and the changes of its action are determinative in this respect. As the colloids thus coagulated absorb a portion of the dissolved plant food-stuffs, the latter decrease under the action of cold or frost.

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(1) See E. MITSCHERLICH, *Bodenkunde fur Land- und Forstwirte*, S. 87,98. Berlin, 1905. (*N. d. R.*).

(2) See *B.* Nov. 1910, pp. 23-24. (*Ed.*).

2. The action of heat also induces a coagulation of the colloids, and consequently a shrinkage of the soil surface; on the other hand it increases the solubility of the nitrogen, which is however brought about by a purely chemical reaction.

3. The coagulation, and in consequence, a shrinkage of the soil surface, are also caused by electrolytes.

D'ANDRIMONT, R. **The Principles of the Circulation of Water in Tilled Soils and their Application.**—(Les principes de la circulation de l'eau dans les terrains meubles et leurs applications).—*Verhandlungen der zweiten Internationalen Agrogeologenkonferenz*, IV, pp. 117-124. Stockholm, 1911. 481

According to the writer, the water contained by a tilled soil can be present in the four following conditions:

1) *Capillary Condition.* The water fills all the interstices and, further, each soil particle adheres to its neighbour by means of a layer of water which exercises a capillary attraction. At the exact point of capillary saturation, the mass of soil and water shows a certain cohesion and the water does not percolate.

2) *Intermediate Condition.* When through trituration, the conditions are altered of a soil completely saturated with a quantity of water corresponding to the volume of the spaces between the particles, these spaces increase, and the water is no longer able to fill them. The water then retires and the soil particles are merely united by small drops of water; further, the particles are enclosed by a film of liquid continuous with the drops. But the air circulates between the particles and the drops.

In this condition, certain soils lose their plasticity while still retaining a certain cohesion.

3) *Pellicular Condition.* When soil is continuously worked, it dries rapidly on account of the circulation of the air through the mass. The dimension of the droplets of water which unite the soil particles decreases to the point where capillary attraction ceases, and the water exists then in the state known to physicists as " superficial condition " and which we call pellicular, that is to say, it forms an invisible covering to the particles, but the soil has still a humid appearance. In this condition the particles adhere to one another as long as the film retains a certain thickness, but the soil has entirely lost its plastic property.

4) *Apparently Dry Condition.* If soil is dried still further, there is no longer sufficient water to cover the particles and produce adherence, for it retires into their microscopic cracks and minute

cavities; the water content of the soil, in such a case, depends upon the mineralogical nature of the particles.

From further remarks of the author, it is clear that the soils which plant roots reach are generally saturated with water in the pellicular state, except in the following cases where the imbibition is capillary.

a) In the case of the first few centimetres below the surface, after fairly heavy rain, but this capillary imbibition does not however continue.

b) In less absorptive strata, such as exist at a slight depth.

c) At the level of the water-containing strata, or where these are situated little below the surface.

From this it may be deduced, that it is not enough to study, as is usually done, the maximum absorption capacity of the soil (capillary condition) but also the method of the water circulation in the pellicular condition. A plant lives upon water and the nutritive substances dissolved in the latter, and thus diminishes the thickness of the pellicular layer in its immediate neighbourhood; as a result, the water layer spreads out evenly between the particles and makes its way particularly towards the roots. Generally speaking, it may be said that the amount of water and of the nutritive substances used by the plant does not depend only upon the water content of the soil, but also upon the velocity of the circulation in proportion to the quantity. The maximum rate of circulation does not, however, always depend upon the maximum of imbibition ; this is especially the case in clay soils.

Every soil can be described by means of diagrams giving the proportion of water and the speed of its rise (capillary and pellicular). A combination of the two diagrams would give the optimum degree of imbibition for the development of a plant.

By this method, a rational method of irrigation and drainage could be established.

482 HUME, W. F. **The Study of Soils in Egypt.** — *Verhandlungen der Zweiten Internationalen Agrogeologenkonferenz*, pp. 301-319. Stockholm, 1911.

Egypt

This is an interesting article on the classification, formation, and quality of the soils of Egypt studied from the points of view of:

1. The Climatic Factor.
2. The Geological Factor.
3. The Time Factor.
4. The Influence of Vegetation and Animal Life.

Climatic Factor. — The climatic question may be summed up as follows:

1) The general climatic conditions of Egypt have not undergone any sensible change in the last century at least.

2) Increased cultivation may have led to enhanced evaporation in the fertile area of the Delta, making the relative humidity conditions probably higher in some parts

3) It is desirable that careful meteorological records should be kept, not only in large towns, but also in certain areas typical of great agricultural centres.

The Geological Factor. — The geological factor in Egypt appears simple at first; nearly the whole of the agricultural land has been deposited from the Nile, and is only in small degree dependent on the geological structure of the desert regions bordering its valley. The most valuable ingredients are those derived from great masses of basaltic material from northern Abyssinia.

Sir W. Willcocks recognizes four types of soils:

1) The well-known dense black clay of a depth of over 6 or 7 metres, which is very rich, and especially suitable for cotton. Such soil has not been anywhere injuriously affected by heavy irrigation, except where the canals have been run at a high level throughout twelve months of the year.

2) A dense black clay of from 1 to 3 metres in depth, overlying sand. Wherever canals running during winter and summer at a level higher than that of the country have been introduced, a deterioration of the soil has been very marked. Where, however, canals running at a level of about 2 metres below the surface in those seasons have been introduced, the happiest results have been obtained.

3) A sandy clay, especially suitable for maize and root-crops. According to Sir W. Willcocks, the introduction into such lands of canals running at high level in winter and summer has converted the country into marshy soil.

4) An almost pure sandy or gravelly soil, occurring at various localities in the Delta itself and forming the desert edges in the Nile valley.

The soil problem in Egypt involves:

A) How best to distribute the maximum amount of water containing the soil-forming mud over the widest possible area. The effort to attain this object has involved the marked change from basin to perennial irrigation. This involves however:

B) A careful study of the changes which the soil may undergo as a result of the multiplication of canals. This question is of greater importance than appears at first sight. In basin irrigation, though the water enters through the regulators with a rush, it is subsequently at rest in the basin, and the materials contained in it slowly settle, directly in proportion to the coarseness of their texture. The finest material is captured as a surface film. In canal irrigation, the amount of surface water containing the finest material may be relatively small in proportion to the total amount carrying coarser material. The question requiring study, is, to what extent canal irrigation tends to diminish or increase the value of the soil by diminishing the percentage of fine silt, or rather causing a more intimate admixture of coarse and fine silt.

C) A change to a coarser soil-texture would involve a rise in the water-table, and consequently an accumulation of injurious salts, but the more open texture of the soil is probably of agricultural advantage.

The geological problem in the greater part of Egypt from the agricultural standpoint is thus, the study of the characters of a river deposit, with its coarser elements near the current centres, and the finer particles deposited on the outskirts of fluviatile influence. This involves also the determinatian of old river channels, and, especially, a careful examination af any soil changes which may be effected by the introduction of canals with increased power of transport of the coarser constituents.

Analysis of Soils. — Mr. F. Hughes, chemist to the Khedivial Agricultural Society, has made an important series of soil analyses. The method adopted for determining the " total " constituents was extracting with concentrated hydrochloric acid for twenty-four hours, and for the " available " constituents Dyer's citric acid method.

Fifteen samples were analyzed, the physical analyses, chemical analyses, field-trials for cotton with varying manures and the ginning out-turn of cotton being noted. The points bearing on the soil question on which emphasis is laid are:

1) The irregularity in the quality of the soil, a very noticeable feature in Egypt and which will render a soil survey one of great difficulty in this country.

2) The relation of average yield to chemical composition of the soil has been somewhat inconclusive, though soils richer in nitrogen, soluble potash, and phosphoric acid, and also in soluble silica give a somewhat better average yield than those with less.

3) The relation of yield to the physical properties of the soil is more marked, the proportion of clay (here, taken as material with soil particles less than 0.002 mm. diameter) shows that the

five best stations gave 34.9 % of clay, the five lowest yielding 27.2 %.

The examination of the work already done on Egyptian soils leads to the following general conclusions:

1) The study of the soils in Egypt is one of the variation in river-borne materials, and especially of the relations of two extreme physical types, the sands and the clays.

2) A vertical soil survey map on the scale of 1 : 25 000 would be very useful in showing where clay and sand are respectively dominant in different parts of the country, modifications being introduced as experience dictates whether the arbitrary lines selected agree best with the agricultural necessities.

3) It is especially to be wished that the soil variation should be studied where changes are being made in the supply of water, so that the agricultural development may correspond with the changes in the nature of the soil.

4) The study of the changes in salt contents, and the circumstances which lead to the augmentation or diminution of these materials in Egyptian soils is of prime importance, the possibility of the accumulation of sodium carbonate especially requiring attention in certain areas.

SCHREINER, OSWALD and SKINNER, J. J. **Organic Compounds and Fertilizer Action.** — *U. S. Dept. of Agric., Bureau of Soils, Bull.* 77, p. 31 + figs. 5 - pls. II. Washington, 1911. **488**

United States

In the preface, one of the Authors remarks that the action of fertilizers is not yet entirely understood, and is not due solely to the addition to the soil of nutritive substances as such; many other factors contribute to determine the yields of crops, and these factors make the action of fertilizers more, or less, effective.

The study of these factors should then assist in establising a more definite, rational, and remunerative system of manuring.

In earlier investigations, also carried out by the Bureau of Soils (1), organic bodies injurious to the growth of plants were isolated; further experiments showed that the toxic action of dihydroxystearic acid on wheat could be modified by the action of manures (2).

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(1) SCHREINER, O. and SHORY, E. C. « The Isolation of Harmful Organic Substances from Soils ». *U. S. Dept. of Agric, Bureau of Soils, Bull.* 53.

(2) See *B.* Dec. 1910, pp. 217-218. (*Ed.*)

In the investigations now under consideration the action of coumarin, vanillin and quinone, all injurious to plants, was studied in the presence of nutritive salts in various proportions, but with a total concentration of 80 : 1 000 000.

The number of culture-solutions was 66, representing all the possible combinations of phosphoric anhydride, nitrogen (calculated as ammonia), and potash, at every 10 % of the total concentration mentioned above. One series of experiments was made with the nutritive solutions alone, and the other with the addition of 10 : 1 000 000 coumarin, 50 : 1 000 000 vanillin, and 10 : 1 000 000 quinone separately. Besides these solutions, other experiments were made in the open ground with the same nutritive materials at a total concentration of 100 : 1 000 000, with the addition of 50:1 000 000 coumarin.

In these experiments, the injurious effets of coumarin, vanillin and quinone were determined by the following criteria:

1. Diminution of the fresh weight.

2. Morphological alterations: with coumarin, shoots stunted, eaves large and twisted; with vanillin, less development of shoots and roots, with quinone, plants tall and slender, leaves narrow and delicate; with solutions of 100 : 1 000 000 the plants were killed, and with those of 50 · 1 000 000 they were severely injured.

3. Diminution of absorption of nutritive materials: coumarin lowers the absorption of potash and nitrates more than that of phosphates; quinone lowers that of phosphates more than that of nitrates and potash; the effect of vanillin was not determined.

On the other hand the nutritive salts exercised a compensating action on the injurious action of the poisonous bodies. Thus phosphates are generally most efficacious against coumarin, nitrogenous substances against vanillin, and potash against quinone.

Under normal conditions, the best development occurred where nitrates and potash together predominated; but in the presence of coumarin the best result was obtained with predominance of phosphates; in the presence of vanillin with nitrates; and in the presence of quinone, with potash.

The different actions of fertilizing materials, and, on the other hand, the different requirements in nutritive substances, show great similarity with the observations of practical agriculture as to the different manurial requirements of different soils. Considering the presence in the soil of injurious organic bodies similar to those used in the experiments, and that the composition of the organic matter varies in different soils, or even in the same soil according to conditions of aeration, drainage and cultivation, it seems evident that the presence of such injurious bodies entails special requirements in manures. These requirements may vary with the weather, according to the nature of the biochemical processes which produce the injurious bodies, or according to the crops whose remains are left in the soil; in short, according to the rotation. the method of cultivation resulting from it, and the various crops grown.

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SULLIVAN M. X. **The Origin of Creatinine in Soils**. (From the Laboratory of Fertility Investigations, Bur. of Soils, U. S. Dept. of. Ag.). — *The Journal of the American Chemical Society*, Vol. XXXIII, No. 12, pp. 2035-2042. Easton, Pa., December, 1911.

United States

The presence of creatinine in soils was first demonstrated by E. C. Shorey, who extracted it from various soils by means of dilute alkali. The creatinine of the soils might have its origin:

1) as a result of metabolic activity of micro-organisms;

2) from stable manure introduced into the soil;

3) from the disintegration of plant debris and the direct passage from the living plant.

The particular phase of the question of the origin of creatinine in soils, which is considered by the Author, is its presence in plants and consequently in plant debris, and the passage of the creatinine into the soil, either by disintegration of the plant debris, or as a result of cell sloughing, or direct excretion from the living plant.

As shown in the present paper, creatinine was found in the water and water-glycerol extracts of planted soils as well as of soil which had not been recently cropped; but was present in larger amounts in the recently cropped soil, thus indicating that the appearance of creatinine was connected in some way with plant growth. Creatinine was also found in the water in which seedlings had grown. It was found also in wheat seeds, wheat seedlings, and wheat bran, in rye, clover, alfalfa, cowpeas and potatoes. If, as is suggested by several investigators, creatinine in the animal arises as the result of the breaking up of albumin, then it seems reasonable to expect that creatinine would be found in practically all plants.

Though the amount of creatinine and creatine (1) in vegetable matter is small, it is worthy of attention, since by the decay of plants, green manures, etc., and by direct cell sloughing or even by osmosis, the creatinine and creatine are left in water and soil, where they exercise an effect on subsequent plant growth. Creatinine seems ro persist for a considerable time in soils and may increase by accumulation.

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(1) Creatinine is the anhydride of creatine, an organic nitrogenous constituent of muscle, which is found also in blood and urine. (*Ed.*).

Since both creatine and creatinine have a favorable effect on plant growth, their presence in plants and in the medium in which plants grow has considerable bearing on soil fertility (1).

485 RUSSELL, E. J. and PETHERBRIDGE, F. R. **Partial Sterilisation of Soil for Glasshouse Work.** -- *Journal of the Board of Agriculture*, Vol. XVIII, No. 10, pp. 809-826 + figg. 7. London, January, 1912.

United Kingdom

The favourable conditions of warmth, moisture, and food which the grower under glass secures for his plants, encourages also a host of other living things, animal and vegetable. But recent experiments on partial sterilisation have shown that it is possible to greatly reduce the number of these organisms (2).

The practical application of the methods to be employed are described in detail in the paper under review, and the following conclusions are reached:

1. Partial sterilisation of soil increases the supply of food for the plant, somewhat alters the growth of the plant, and kills insect pests.

2. It may cause a temporary retardation in germination and in early growth, the amount of which varies according to the nature of the soil, the seed, and the general conditions.

3. In these experiments it did not prove advantageous for pot work, where abundant supplies of clean virgin soil and manure are available.

4. It is, however, very useful for work with borders, cold frames, and for plants that are to run for some time without manure. It leads to better root development, sturdier and healthier plants. earlier flowering, more prolific fruiting, and better quality of fruit.

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(1) See also: SCHREINRR, O.; SHOREY, E. C.; SULLIVAN, M. X.; SKINNER. J. J. A Beneficial Organic Constituent of Soils: Creatinine. *U. S. Dpt. of Agr. Bur. of Soils, Bull. N.* 53, pp. 44 + pl. III + Bb. VII, Washington, 1911. — In appears too, according to Skinner that creatinine and creatine can replace the effect of nitrate in plant growth. *(Ed.)*.

(2) See *B*, Jan. 1912, No. 45.

5. It is particularly useful for commercial glasshouses where soil pests are a source of trouble, and soil « sickness » sets in.

6. At present the most effective method of partial sterilisation is to heat the soil to a temperature above 140° Fahr., but not exceeding 212° Fahr. Very satisfactory results have been obtained between 180° and 200° Fahr.; ½ cwt. or less fuel is required per ton of soil; capital and labour charges depend on the speed at which the process is to be worked. The experiments showed that effective chemical treatment (with coal-tar products) is also possible, and would be much simpler, but Messrs. Russell and Petherbridge have not yet tested a sufficient number of commercial products to be able to discuss the problem from the grower's point of view.

There are two methods of sterilisation by heat: 1) *Steam Heat*; 2) *Dry Heat*.

With *steam heat* the most economical pressure has yet to be determined.

When the pressure was at 80-90 lb. the total cost worked out at 1*s* 6*d* a cubic yard (20 cwt. being reckoned to the cub. yd.). With low pressure steam the cost was 1*s* 2*d* per ton (no allowance being made for the boiler).

With *Dry Heat* there is: 1) the oven method; and 2) the hot-air method. With the former, the heating is irregular and the reverse of economical. With the latter, though there is a certain amount of waste, yet the great advantage is that it can be worked by means of the waste heat from the flues, at a cost of only 5*d* per ton.

The amount of water in the soil is a very important factor in determining the cost of the process. For this reason the writers give a formula by which an approximate estimate of the number of thermal units can be made, if the amount of moisture be known.

Multiply percentage of drv soil (*i. e.*, 100 *minus* percentage of moisture) by 23 for a rich soil, or 21 for a poor one, *add* 100 × percentage of water, *multiply* by 1.6, and *divide* by 100; thus:

$$\frac{[(S \times 23 \text{ or } 21)+(W \times 100)] \times 1.6}{100}$$

Where S = percent. of dry soil, and W = percent of water. The rule breaks down for dry soils The number of pounds of soil heated per lb. of fuel burnt (100 % efficiency) is obtained by dividing the B. T. U. (British Thermal Unit) into 12 000, the calorific power of average quality coal.

The highest degree of efficiency yet observed is about 30 %, *i. e.*, 57 ½ lb. of soil heated per lb. of fuel, the cost being 3 ¼*d*. per ton of soil sterilised.

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION.

486 KRÜGER E. (Chief of the Division for Agricultural Improvements, at the Kaiser Wilhelm Agric. Institute at Bromberg). **Irrigation of Fields**. (Ueber Ackerbewässerungsanlagen). — *Deutsche Landwirtschaftliche Presse*, XXXIX Jahrgang, No. 3, pp. 21-22 ; No. 4, pp. 29-32. Berlin, 10 and 13 Januar 1912.

Germany The drought of 1911 increased the interest in the experiments on field irrigation undertaken by this division for Agricultural Improvement, and the Institute received many requests for information to which the writer replied by the publication of an interesting résumé of his researches. The following are the most important data.

I. PRINCIPLES TO BE OBSERVED IN THE INSTALLATION OF FIELD IRRIGATION WORKS.

1. *System of Irrigation.*

In America, field-irrigation is still generally carried out by means of channels of irrigation.

The population being scattered, there is a copious supply of water, and waste of this commodity is therefore pardonable. Thus 7 500 cub. m. of water per ha. (100 000 cub. ft. per acre) or sometimes even 20 000 cub. m. (285 000 cub. ft.), *i.e.* 2 000 mm. (80 in.), are used per annum.

This enormous amount is necessary on account of the loss of water, by infiltration consequent on the channel irrigation method. It is not therefore possible for the water to be equally divided over the surface of the field to be irrigated.

Such loss of water cannot be permitted where the supply has to serve for various purposes.

The loss by infiltration in the case of light soils, which require the most irrigation, is enormous. Therefore the channel irrigation system is only advantageous on very gentle uniform slopes of great extension, such as occur in America. These conditions do not obtain in east Germany where the surface of the ground is very uneven, and where irrigation is best carried out by spraying water under pressure. This system is suitable for every type of surface, and the water-supply is used to far better advantage than in the case of irrigation channels, as was proved by the writers' experiments.

2. *The Necessary Amount of Water and its Sources.*

The necessary amount of water, and consequently the difficulty of obtaining it, is generally estimated too low.

Mr. Krügers' experiments show that potatoes and oats are the crops which benefit most from irrigation, and an annual depth of 120 mm. (4.7 inches) suffices amply for them ; winter rye only needs half this amount, but savoy cabbages require twice as much.

Taking the average quantity of water at 100 mm. (4 in.) the complete irrigation of 100 ha. would need 100 000 cub. m. (per 100 acres 1 452 000 cub. ft).

The plants need daily, to resist the effects of drought, at least 2 mm. which is the equivalent of 2 000 cub. m. per day for 100 ha. (290 400 cu. ft. per 100 ac.).

Allowing for 15 hours of work daily, this amount of irrigation would require 37 l. (1.3 cu. ft.) of water per second.

In years of extreme dryness, like that of 1911, an increased supply would have been very beneficial, but the amount mentioned gave satisfactory increase in the yield and is sufficient for average seasons.

So large an amount of water is best obtained from a river or neighbouring brook. In Germany 1 l. per sq. km. (0.57 gallon per sq. mile) or even less, runs off in times of great drought, the streams must have a basin of 40 to 50 sq. km. to irrigate 100 ha. (6 to 8 sq. miles for 100 acres) during the season of low water. Experience however shows that streams of these dimensions are often dry.

It is therefore necessary to determine in each particular case if the stream has a sufficient continuous supply of water. Lake water can also be had recourse to. If the lake is fed by springs or streams and has an outlet, the volume of the effluent will of course be somewhat diminished. It should be noted that increased demands upon the lake only cause the springs to flow the more strongly.

Recourse can also be had to wells and springs, provided their output is ascertained.

3. *Installation of System of Irrigation.*

Irrigation by spraying, which necessitates the use of water under high pressure, needs the employment of a pump driven by machine-power, pipes for carrying the water to the field, and sprinkling machines to turn the water into spray. The best pump for the purpose is a high-pressure centrifugal one ; the ordinary pump does not supply sufficient pressure.

To supply the motor force, only a steam engine, or other powerful machine can be used. Such steam-engines which are so much used on large estates and for which there is no other employment at the time of irrigation can be thus turned to good account.

For each hectare of surface to be irrigated 0 4 to 0.5 H.P. (per acre 0.16 to 0.2 H.P.) is necessary ; this alone excludes the use of wind motors without the consideration of their irregular action.

For the main pipes only iron can be used, for no other substance will stand the high pressure Nevertheless, flexible hose of vulcanized hemp are not to be despised.

These serve, not only to connect the sprinkling machines with one another and with the source of delivery, but also permit of a change of direction in the latter. But as little as possible of this hose should be used, as it does not last well.

The main-pipes must have a diameter sufficient to prevent the average speed of the water from exceeding or remaining below 1 m. (3.28 ft.) per second. This speed must however often be exceeded in the case of the sprinkling carts by reason of their construction.

4. *The Amount of Each Irrigation.*

Part of the water used wets the aerial portions of the plants and is lost through evaporation. Another part is lost from the evaporation of the water which has fallen on the ground, and the rest filters into the soil and reaches the roots.

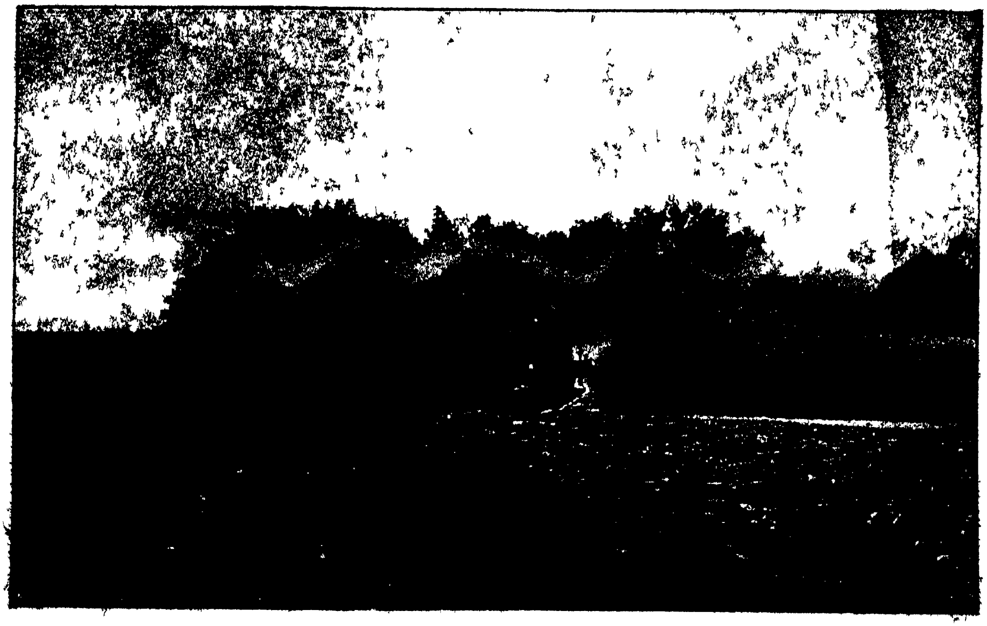
Therefore, the loss by evaporation remains fairly constant independently of the amount of water used each time.

Since the amount of water used is proportional to the volume of each watering, the latter should be increased as much as possible, which has the further advantage that the sprinkling carts have not to be moved so often. Care should however be taken so as not to cause new losses by infiltration.

The writer found that on light sandy soil 30 mm. (1.18 inch.) of water could be used each time without fear of loss due to infiltration. Three or four waterings would than suffice for the year.

Permission of the Deutsche Landw. Presse

Fig 1 — Rodatz watering machine



Permission of the Deutsche Landw Presse.

Fig 2 — Rodatz watering machine working.

Permission of the Deutsche Landw Presse

Fig 3 — Szczepkowski watering machine working

Year	Rainfall April-July	Crop	Yield per acre			Increase per acre		Increase per 100 cub. ft. of water	Cost per acre			Net gain per acre
			Unwatered	Watered								
				with					Watering	Manuring	Total	
	in.		cwt.	in	cwt.	cwt	£ s d	d	£ s d	£ s d	£ s d	£ s d
1907 . .	11.7	Oats	13	4.5	19	6	3. 9. 9	5	—	—	—	—
1908 . . .	9.3	Oats	10	5.5	19	9	5. 9.10	6 3/4	—	—	—	—
1909 . . .	6 4	Oats	12	5 5	25	13	5.19 .9	7	1.18.10	—.11.11	2 10. 9	3. 9. 0
1909 . . .	6 4	Potatoes	137	4 3	259	122	7.11. 0	11 ½	1.10. 6	1 5. 9	2 16. 3	4.15. 9
—	—	(Starch)	22	—	48	26	—	—	—	—	—	—
1910 . . .	11.6	Winter Rye	16	3 1	19	3	1.15. 8	3 3/4	—	—	—	—
1910 . . .	11.6	Spring Rye	10	2.8	13	3	1.10. 1	3 ½	—	—	—	—
1911 . . .	4.1	Potatoes	62	11 0	210	148	18. 6. 8	13 ½	3.17. 8	1. 5. 9	5. 3. 5	13. 3. 3
—	—	(Starch)	11	—	44	33	—	—	—	—	—	—

In this table the current market prices are given. Although the increase in straw is not given, its value has been reckoned in the gain.

The cost of irrigation has been valued at 7 pf, per cub. m. (2 ⅓ *d* per 100 cub. ft.) estimated on actual cost of working and including the interest, liquidation and up-keep.

The cost of fertilizers has been estimated by the difference between the cost of the fertilizers employed for irrigated plots and that of those used for non-irrigated, calculated according to Wolff's tables.

Naturally on a large scale, it is impossible to obtain the same increase of yield as in trial fields ; nevertheless, under practical conditions irrigation can be employed with much profit.

For the practical agriculturist, it is of interest to have details of irrigation works which are at present in working order, therefore Hr. Krüger describes two in the Province of Posen. *viz.*

(1) Those of the estate of Ulrikenhof near Jaratschewo, the property of Hr. Rod .tz, who farms state land.

(2) Those on the property of Hr. von Szczepkowski, at Leng near Schrimm.

II THE ESTATE OF ULRIKENHOF.

The irrigated surface amounts to 20 ha. (50 acres).

The water is obtained fom a ditch in the meadow, whose water usually flows into the Obra, but is dammed back at the period of irrigation. A high-pressure centrifugal pump worked by the steam-engine of the estate sends the water into the main pipes under a pressure of from 3-5 atmospheres. Irrigation is carried on from 5 a.m to 8 p.m with one hour's interval at midday, and at 17 litres (3 3/4 gallons) per second. The ground, which is 12 m. (39 ft.), above the water of the ditch, is sandy to loamy with numerous patches of gravel. The main pipe, 1450 m. (4770 ft.) long consists of cast-iron pipes, of which 800 m. (2620 ft.) have an internal diameter of 125 mm. (5 in.), and 650 m. (2140 ft.) a diameter of 100 mm. (4 in.). The smaller pipes terminate the main system which is fixed and sunk in the ground.

Every 25 m. (82 ft.) the main system has cocks to which the watering apparatus can be connected by means of hemp hose 42 mm. (1 ½ in.) in diameter.

The watering-apparatus of the Hartmann system, which was used in 1910, was not very satisfactory, so that the inventor has improved it (1).

In 1911, six machines of the Rodatz system were also employed. The Rodatz apparatus (figs. 1 and 2), which is all of iron, consists of: 1) a frame with four very wide wheels, the tyre being 50 cm. (20 in) wide, provided with two handles which allow of one man shifting it

2) A pressure pipe fixed on the frame and surmounted by three other pipes directed upwards and forming a double-triangle with a long horizontal pipe of 12.5 m. (41 ft.) The latter carries three roses which send out a fine spray over a surface 10×25=250 sq. m. (300 sq. yds.) round the machine

These machines, constructed by the Borck agricultural machine works cost 480 marks (£23.10*s*) each.

Experiments made hitherto have shown that cereals must be watered in spring from May 20th to July 10th, that is to say, about 50 days Potatoes and turnips must be irrigated from June till September and serradella from June 1st to Sept 1st, winter rye needs watering only in May.

For the watering on the Ulrikenhof estate, only two men and a mechanic are required ; even these are not occupied the whole time, and Hr Rodatz reckons that they could well look after 8 machines.

In 14 hours 990 cub. m. (35 000 cub. ft.) of water are sprayed; this amount for 50 days is sufficient for 41 ha. (101 acres).

The cost for labourers wages, including the mechanic would be 3.7 marks per ha. (1*s* 6*d* per acre), a very small expenditure.

In 1911, there were watered· winter-rye, oats, serradella, sugar beets, and mixed fodder (followed by Savoy cabbage).

Watering began in the second half of May. The oats had already received up to 120 mm. (47 in.) of water at the beginning of July. Some control plots were left without watering, Atmospheric precipitations were very slight and amounted to

In April	26 mm.	10.2 in.
» May	14 »	5 5 »
» June	27 »	10.6 »
» July	16 »	6 3 »

---

(1) The new Hartmann system is described in a brochure published by the firm Oppen und Prinzke at Spandau

in all 83 mm. (32.6 in.). Two late frosts (—2°C.) occurred on May 24th and June 11th.

The irrigation produced very marked effects, especially in the case of the oats and serradella as is shown by the following results :

1. *Ligowo Oats.*

Plots 1-12 were very light sandy soil, plot 13 loam. Manure per ha: 75 kg. (67 lbs. per acre) K_2O in the form of kainit; 45 kg. (40 lbs.) P_2O_5 as basic slag ; 45 kg. (40 lbs) nitrogen as nitrate of soda. 100 kg. of oats per ha (89 lbs. per acre) were sown in lines 20 cm. (8 inches) apart on April 25 and 26, therefore very late.

The yield was as follows:

Plots No.	Watered with inches	Yield per acre in cwt		Weight of	
		Grain	Straw	bushel lbs.	1 000 grains gm.
5	—	5 9	4.0	41 3/4	43.5
1-3 and 7-12	5 5	13 8	19.4	42 ½	46.5
13	5.5	25 0	35.5	44 ¼	49.1

Plot 13 having better soil than the others the yield is not included with the others.

The watering cost 83 marks per ha. (£1.12*s* 11*d* per acre). The net gain was 132 marks per ha. (£2 12*s* 4*d* per acre) and represented an interest of 27.5 %

2. *Serradella,* 5 ha. (12 ½ acres).

This crop gave a net gain of 248 marks per ha. (£4.18*s* 4*d* per acre), a very high figure because the control plot was entirely burnt up by the drought.

3. *Winter Rye,* 1.1 ha. (2 3/4 acres).

The watered plots yielded 28.8 qls. per ha. (23 cwt. per acre).
non » » » 17 » » (13 ½ » »).

The increase of 11.8 qls. (9 ½ cwt.) gave a net gain of 168 marks per ha. (£3.6*s* 7*d* per acre).

4. *Sugar Beets*, 4.7 ha. (12.6 acres).

Manure (without dung) 6 qls. (4 cwt. per ac.) kainit, 2 qls. (1.6 cwt.) basic slag, 4 qls. (3.2 cwt.) bone meal, 4.8 qls. (3.8 cwt.) nitrate of soda. Amount of water 260 mm. (10 inches). Watering produced an increase of 97 qls. per ha. (77 ½ cwt. per acre) The respective sugar content was as follows

	Sugar %	Dry Matter %
Watered (large)	12,1	13,5
Watered (average)	14,6	13,7
Non-watered	17,4	17,4

Thus watering did not appreciably increase the sugar content.

To sum up, Herr Rodntz calculates that watering to the amount of 100 mm. (4 in.) per year, sufficient for the average crops, would cost 75 marks par ha (£1.9*s* 9*d* per acre)

III. THE LENG ESTATE.

After numerous previous experiments, watering was undertaken on a large scale in 1911. The Nolting system, entirely reconstructed and perfected by Herr von Szczepkowski, was used.

The water was taken from different parts of the estate and, as the supply was limited, the apparatus was made transportable as were also the main pipes.

The pressure pipe attached to the centrifugal pump which is driven by the steam-engine of the estate, and is laid to reach by the shortest route the edge of the field which is to be irrigated, and then along its centre. The pressure pipe consists partly of a hempen hose 100 mm. (4 in.) in diameter, partly of cast-iron pipes 100 mm. (4 in.) in diameter and 6 metres (20 ft.) long. The watering machine (fig, 3) is made up of an iron pipe 6 metres (20 ft.) long mounted on 2 wheels, which carry at either extremity a rose which can throw spray 3 metres (10 ft.) on all sides. The machines are joined by 6 metres (20 ft.) pieces of hose, 10 being placed in a row, thus covering a width of 120 m. (400 ft.).

This apparatus in constructed at J. Moegelin's machine factory in Posen. When it has watered one strip of ground it is pushed 4-5 m (13-16 ft.) forward to water the next piece. As the main pipe is provided with cocks 120 m. (400 ft.) apart, to which is attached the hemp hose, it is possible to water without interruption a strip of soil 120 m. (400 ft.) wide; and the same in length.

In order to irrigate the next 120 m. (400 ft.), in length, the hemp hose is attached to the second cock. When this length of of ground has been watered the whole apparatus is turned round 180° and works in the opposite direction, in the order of the coks... III, II, I. When this operation in completed the movable water-system is moved to a distance of 240 m. (800 ft.) parallel to its first position, and watering is resumed according to the same method. It will thus be seen that the apparatus can irrigate two large strips of ground from both parts of the main-pipe without altering the position of the latter.

The system employed at Leng possesses the advantage that by it a field of 1.44 ha. (3 ½ acres) can be irrigated without interruption. It has only one drawback, that the cereals which have already attained some height are injured by the passage of the workers and the wheels.

Herr von Szczepkowski estimates the cost of installation at 4485 marks (£220), which to the writer appears rather low. In addition to the mechanic its working requires two other men.

Atmospheric precipitation at Leng was in 1911 very low, namely:

In April	6 mm	0 24 in.
» May	7 »	0.28 »
» June	11 »	0.44 »

Oats, serradella and lupins were watered. In spite of the unusual drought, and the excessive lightness of the sandy soil irrigated, and although only one irrigation of 20 mm. (0.8 in.) was given, the operation was completely successful. Herr von Szczepkowski estimates the increased yield of the oat crop due to this scanty irrigation of 20 mm. at 5.4 qls. per ha. (4 3 cwt. per ac.) with a value, counting the straw, of 108 marks per ha. (£2.2*s* 10*d* per acre). The watering only costs 14 marks per ha. (5*s* 7*d* per acre), leaving a net gain of 94 marks per ha. (£1.17*s* 3*d* per acre) as the result of a single watering.

IV. CONCLUSION.

When an underground fixed main system is used, more capital must be expended on the pipes. But on the other hand, the constant shifting of a movable system requires more labour. Which of the two methods is preferable ? It may be said that the movable system is more suitable where, as at Leng, several sources of water can be used for the irrigation of a limited space, and also when a are required 2 kilowatt-hours, or ⅓ gallon of engine distillate, or 13 lbs. of coal.

Taking these figures as the basis and assuming prices to be as follows:

electricity: 3 cents per kilowatt-hour;
gasoline: 22 cents per gallon;
coal: 6 dollars per ton;

the cost of the energy expended is:

6 cents for an electric motor;
7 ⅓ cents for a gasoline motor;
4 cents for a steam engine

The costs of upkeep do not exceed 5 cents per hour for an electric motor, 10 cents for a gasoline motor and 40 cents for a steam engine.

The repair costs do not exceed 1 % of the total cost of the plant for electric motors and 1 to 1 ½ % for gasoline and steam.

The fixed charges amount to 16 % of the capital invested for electric motors, and 18 % for gasoline and steam engines.

Combining all these data, a good estimate may be formed of *the cost of installation and the annual expenses of pumping plant.*

It is desired, for instance, to lift the water required for irrigating an area of 40 acres to a height of 100 feet. 6 inches depth of water are given per month, the irrigation season lasts 4 months and the pump only operates ⅓ of that time.

Under these circumstances a 40 HP plant is required, costing not more than 2 000 dollars, or 50 dollars per acre.

The annual costs of pumping per acre are given in the following table:

Motors	Fuel or energy	Upkeep	Repairs	Fixed charges	Total
Electric .	$ 12	$ 1.2	50 cents	$ 8	$ 21.7
Gasoline .	$ 14.66	$ 2.4	75 »	$ 9	$ 26.8
Steam ...	—	—	—	—	$ 27.35

From these figures it will be seen that the cost of lifting one acre foot to a height of 1 foot is 12 cents.

This cost is not excessive; it is justified by the fact that at the present time ordinary irrigations, where water circulation takes place by gravity alone, require the creation of dams and the laying down of very expensive channels and pipes.

Thus the Trenton scheme in the East of Washington, carried out by the United States Reclamation Service, costs 93 dollars per acre; the Umatilla scheme in the East of Oregon 60 dollars per acre.

On the other hand, pumping plants erected in different regions have yielded excellent results. At the present time in the East of Washington State water is pumped from a depth of 250 feet. In the citrus districts of California it is quite a usual thing to pump from 200 feet depth, and plants pumping from as much as 460 feet depth are regarded as remunerative..

The cost of pumped water in the district of Pomona (South California) is 15 dollars per acre for one acre foot.

The United States Department of Agriculture has carried out enquiries showing that the cost of pumping by private plants of 10 to 100 HP with lifts between 100 and 300 feet ranges from 10 to 90 dollars per acre foot.

Pumping plant pays above all in apple orchards, the net profits of which may be 200 to 600 dollars per acre.

VEAUVY **Salt Encroachment. New Methods for Freeing Lands from Salt.** (L'envahissement salin. Nouvelles méthodes de dessalements des terres). — *Le progrès agricole et viticole.* 28e Année, No. 53, pp. 795-799. Montpellier, 31 Décembre 1911. **488**

Algeria

For all cultivations on a large scale, irrigation should supplement rain-water and not be regarded as the sole source of moisture. In the low-lying clayey plains under the North African climate, excessive and ill-planned irrigation generally results in inevitable salt deposits, which are an ever-growing menace to North African agriculture. The Author relates, by way of exemple, what took place in the irrigated plains of Oran.

1. *Condition of things before the introduction of irrigation.*

The partly irrigated plains of the Sig, the Habra, the Mina and the Cheliff are formed by alluvial soils carried by the rivers which traverse them. They were formerly periodically inundated by the heavy winter floods of the rivers, but these inundations were as a rule transitory, so that they hardly had any influence on the subsoil water table, the water passing over too rapidly to make its way to any depth into the land.

2. *Condition of things after the installation of irrigation.*

a) At the present time the waters of the big floods, which carry much salt and are consequently most fertilising and contain the least salt, generally run to the sea without covering the plains. The canals with their insufficient fall are incapable of affording an outlet to these waters, and the silting of the canals would be too considerable and consequently the process too expensive.

b) The waters most heavily charged with salt, which are the clearest and therefore the least fertilising, are spread over the surface of the land in the heart of the summer.

c) Rain water added to excessive irrigation has had a considerable influence on the subsoil water tables, the levels of which have sometimes been raised 5 or 6 metres (16 ft. 3 in. to 19 ft. 6 in.). The water table at times becomes flush with the surface of the soil.

d) One of the most powerful causes of the rise in the water table is due to the formation of marshes in the basins traversed by the irrigation channels within embankments. These channels thus form real obstacles to the outflow of the surplus waters, which are always extremely saline from contact with the soil on which they have circulated. The surplus water therefore stagnates in the depressions and slowly disappears by evaporation or infiltration. This drawback should be met by the construction of a drainage canal parallel to each irrigation canal.

Consequences: The salt invades the whole of the irrigated lands. The entire evil consequently results from the considerable quantities of water the land is made to absorb (causing a rise in the level of the salt water table) and from the excessive evaporation taking place at the surface of the ground and producing saline deposits.

Remedies. Movements of salt in the soil.— The salt makes two opposite and alternating movements in the soil: 1, rising during the dry summer period; 2, sinking during the wet winter period. The principal factors governing these opposite movements are: 1, the larger or smaller quantities of rain water and irrigation water; 2, the permeability of the soils and subsoils; 3, capillarity; 4, the increased evaporation due to the heating of the soil. If one of these factors were got rid of, however, the movement would be suspended. Therefore saline encroachments may be dealt with by different means, the selection of which must vary with the particular circumstances.

Getting rid of salt from non-irrigated regions with deep water table. — To enable this method to yield successful results, the salt water table must be maintained at a depth of 1.50 metres (4ft. 10in.) during the winter time. The system consists in allowing the sinking movement to take place and in preventing the rise. When the heavy rains come on, the salt is carried away by the water and descends with the latter. At the end of the heavy rains a superficial ploughing of 6 to 8 cm. (2.4 to 3.2 inches) depth should be carried out, followed by one or two thorough harrowings in order to loosen the surface; evaporation is thus stopped. After each successive rainfall another superficial ploughing must be done. This of course should be repeated whenever a crust, even a thin one, might form, until the next heavy rains.

By the time these latter come on the salt has been able to rise only very slightly. The heavy rains once more carry down the salt deeper. From that moment, in the majority of cases, the surface layer of the soil is clear of salt, and cultivation is made possible. In these lands, for all cultivations, the method of drilling in lines some distance apart should be adopted, which allows of thorough hoeing and earthing up during the growth of the crops.

After the crop, fresh surface tilling should at once be carried out, in order to prevent evaporation until the return of the heavy rains.

Getting rid of salt from irrigated lands. — On irrigated land the same methods of preparing the soil, of sowing in lines and of after-tillage should be adopted. The insufficiency of rain may be made up for by the possibility of irrigating throughout the winter. Summer irrigations may be made less frequent and plentiful in consequence of the salt having been got rid of. After the crop the soil must be immediately loosened along the whole of the surface to prevent evaporation until the heavy rains. From this it will be seen that in addition to its other advantages, the method allows of irrigating areas twice as large as at present with the same volume of water.

TILLAGE AND METHODS OF CULTIVATION.

CASCÓN, JOSÉ. **Ploughing in Spain.** (Labores). — *Boletin de Agricultura tecnica y económica*, Año III, No. 36, pp. 1120-1124. Madrid, 30 Diciembre 1911. **489**

To make a good furrow, it is necessary to know the proportion which ought to exist between the width and depth. The width ought to be 1.3 to 1.5 of the depth. This is the extreme limit; the higher figure is used in the case of light soils, the lower when the soil is heavy. **Spain**

The following is the method used with a fixed mould-board plough:

The area to be ploughed is divided into a certain number of portions, which are worked successively.

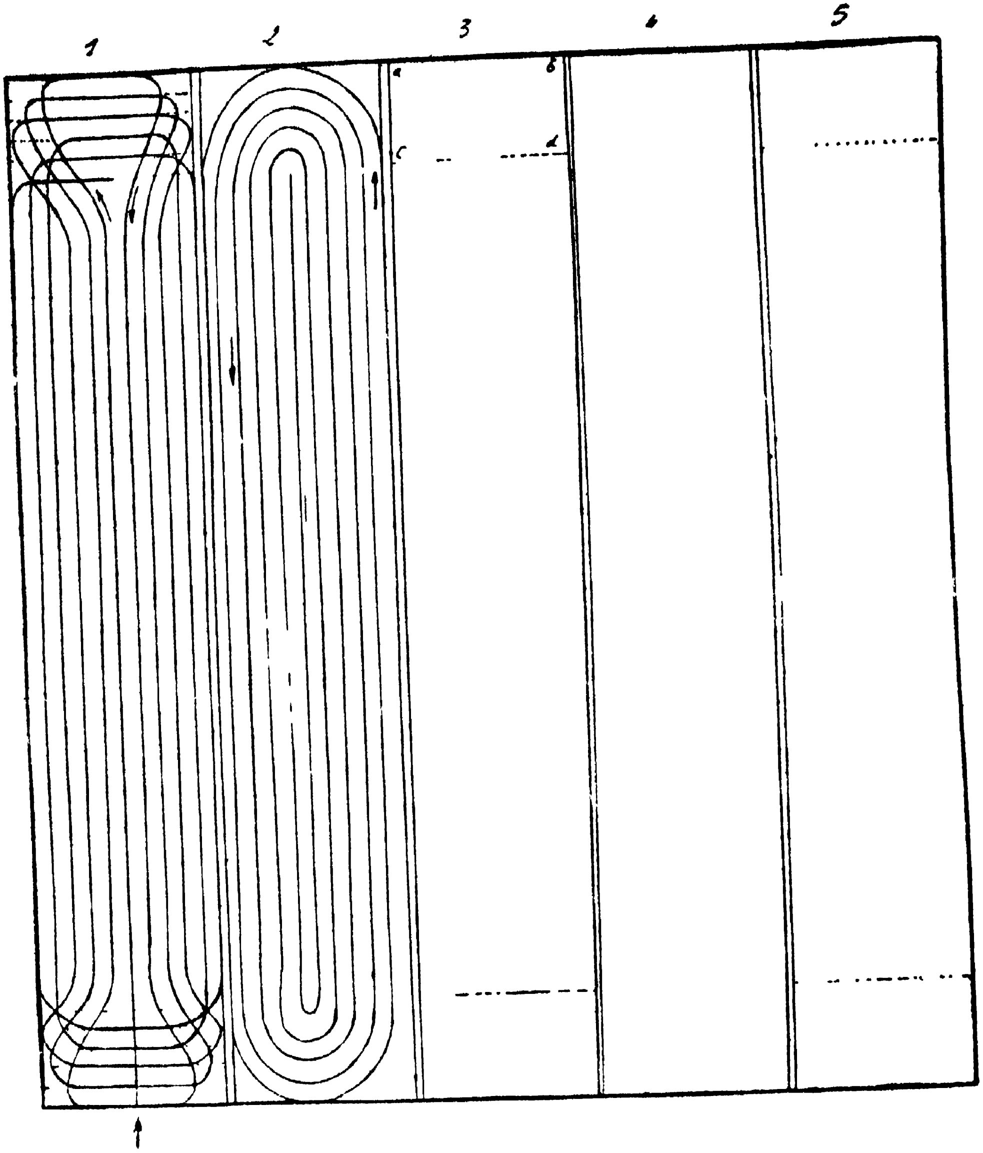
Work begins on the edges of the divisions, the furrow is carried round the extremities, and ends in the centre, as is shown on division 2 of the accompanying diagram. This method leaves in the centre a part which is badly ploughed ; this causes the water to be very unequally distributed, and as a result, the crops are wanting in uniformity.

In order to avoid this, lands are set out 20-30 metres (65.6 ft.-98.4 ft.) wide and 7 to 9 times as long. Then the furrow is begun in the middle of land 1 and ended on the edges (see figure). No. 2 is left out, and no. 3 worked as before. No. 4 is passed over, and no. 5 ploughed. This method is followed to the end of the field.

Then the lands which were omitted are ploughed, beginning this time at the edge and ending at the centre. The figure shows, following the direction indicated by the arrows, that on the edges of two consecutive divisions, the earth is thrown up on the same side, therefore no " last ridges " are formed. These only occur in the middle of the lands represented by even numbers It is to be noted that the extremities *a*, *b*, *c*, *d* of the plots are worked from *a* to *c*, that is to say, from the extremities towards the centre. The area to be ploughed is divided into lands in order that the work may be regular, and to avoid excessive fatigue for the animals.

The amount of work done in one day by a pair of horses or mules, naturally varies according to the time of year, but the following table gives an average for heavy land:

Implement	Area Worked Ares	Area Worked Acres
Simple mould-board plough	40-50	1 to 1 ¼
Double plough (doing two furrows at once	60-70	1 ½ to 1 ¾
Triple and quadruple plough	130-140	3 ¼ to 3 ½
Harrows	350-400	8 ¾ to 10
Diggers	115-120	2 ¾ to 3
Rollers.	200	5
Cultivators.	400	10
Manure distributors . . .	400	10



The arrows show the direction in which the plough travels The work done on the lands bearing the odd numbers is called *alomando* and that on the others *hendiendo*.

Soil already under the plough.

(a) Ordinary system.

		per ha.	per ac.	
One ploughing, two harrowings and sundry expenses	fr.	32.00	10*s*	3*d*
Drilling and cost of seed	»	20.00	6*s*	5*d*
Interculture; harvesting and sundry expenses	»	12.50	4*s*	0*d*
Total	fr.	64.50	20*s*	8*d*

Yield: 12 quintals of grain (9.6 cwt.).

(b) Lister system.

		per ha.	per ac.	
One ploughing, two harrowings and sundry expenses	fs.	32.00	10*s*	3*d*
Price of seed and sowing with the Lister furrow drill	»	60.00	19*s*	2*d*
Interculture: moulding up twice with the Lister cultivator	»	60 00	19*s*	2*d*
Total	fr.	152.00	48*s*	8*d*

Yield: 18 quintals of grain (14.4 cwt.)
Net gain: 62.50 frs (20*s* per ac.).

Virgin soil.

(a) Ordinary system.

		per ha.	per ac.	
Two ploughings, two harrowings and sundry expenses	fr.	60.00	19*s*	2*d*
Drilling and cost of seed	»	20 00	6*s*	5*d*
Interculture, harvesting and sundry expenses	»	12.50	4*s*	0*d*
Total	fr.	92.50	29*s*	7*d*

Yield: 17 quintals of grain (13.8 cwt. per ac.).

(b) Lister system.

		per ha	per ac.	
Two ploughings, two harrowings and sundry expenses	fr,	60,00	19*s*	2*d*
Cost of seed and drilling with Lister furrow drill	»	60 00	19*s*	2*d*
Interculture; moulding up twice with Lister cultivator	»	60 00	19*s*	2*d*
Total	fr,	180 00	57*s*	6*d*

Yield: 25 quintals of grain (20 cwt. per ac.)
Net gain: 112.50 fr. per hectare (36*s* per ac.).

For soils already under cultivation in a dry year the crop secured with the ordinary cultivation system is estimated at 5 qls. per ha. (4 cwt. per ac.) and that obtained with the Lister system at 12 qls. (9.6 cwt.); for virgin soils these crops are estimated at 9 and 16 qls. (7.2 and 12.8 cwt.) respectively.

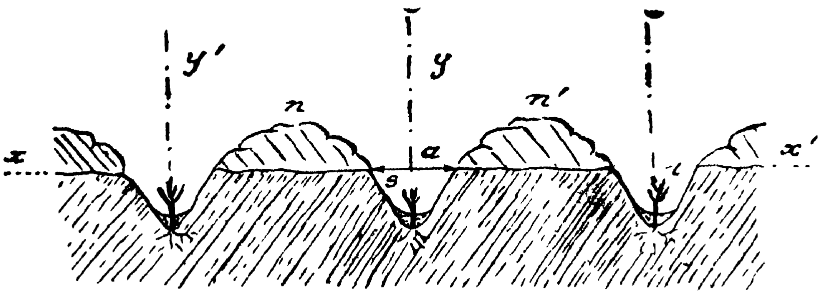


Fig. 1. — Transverse section through the furrows shortly after the germination of the maize

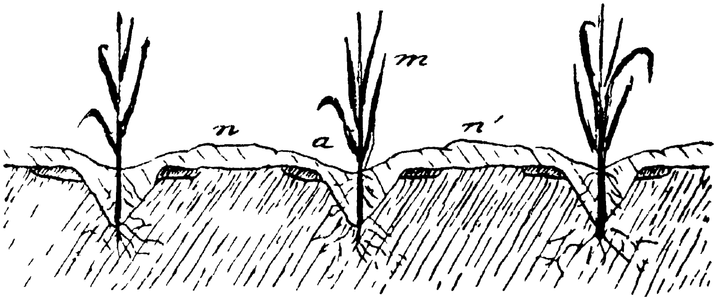


Fig 2. — Transverse section through the furrows after filling in

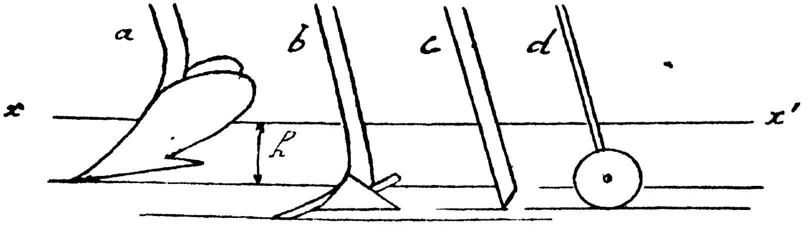


Fig. 3. — Lister drill

a, ridger. — *b*, sub-soiler, — *c*, drill tube — *d*, covering disc. — *xx* soil level. — *h*, depth of work.

the other chemical nitrogenous manures: nitrate of soda, nitrate of lime and sulphate of ammonia.

Let us now consider some of the most recent typical experiments, which, considering their trustworthiness, their duration, their extension, and the widely diverse districts and countries where they were carried out, may be considered of general importance.

Denmark

EXPERIMENTS IN DENMARK. — Experiments were made from 1904 to 1909 in six Danish Experimental stations (2).

The manures used for experiment were nitrate of soda, nitrate of lime, cyanamide, sulphate of ammonia and liquid manure.

Averaging the different crops, soils, and years, and putting at 100 the yield obtained from the use of nitrate of soda, the average results were as follows·

	Root crops	Cereals
Nitrate of lime	79	88
Sulphate of ammonia . . .	71	96
Cyanamide	42	74
Liquid manure	65	72

The average for cyanamide, when it was drilled in, was 68.

The residual effects observed in 1910 showed nothing remarkable ; they were however more evident for the cyanamide and the sulphate of ammonia. The experiments which were afterwards made, on a wider basis, in collaboration with the provincial agricultural societies, gave results which, as a whole, agreed satisfactorily with those adduced above.

England

EXPERIMENTS IN ENGLAND. In the experiments on mangolds at Rothamsted, calcium cyanamide gave similar results to those obtained with sulphate of ammonia, owing to the relative richness of the soil in lime; but in the case of barley the results were less satisfactory. We may here give the most important results gained from the experiments with nitrogenous top-dressings made in 1910 and the preceding years at the Experiment Station of the Royal Agricultural Society of England at Woburn (3). For 1910 they were as follows:

	Oats per ac. Bushels	Mangolds per ac. tons	Mangolds per ac. cwt.
Nitrate of Soda	51.2	34	15
Nitrate of Lime	49.3	36	17
Sulphate of Ammonia . . .	48.7	29	4
Cyanamide.	52.1	35	15 ½

The quantity of nitrogen applied was in the proportion of 1 cwt. per acre of sulphate of ammonia. These results, like those of the preceding year, prove that at an equal price, or rather with equal quantities of nitrogen, the different nitrogenous manures including cyanamide, when applied to cereals as a top-dressing, have practically the same effect. The mangolds behaved in a similar manner, showing even a slight superiority under the cyanamide treatment, though this was less than with the nitrate of lime. As regards the residual effects of these manures on wheat, after the mangolds, they were practically not noticeable; indeed, nitrate of soda and sulphate of ammonia had rather a depressing effect, while cyanamide gave an increase of 1 $\frac{1}{2}$ cwt. per ac. as compared with 2 $\frac{1}{4}$ cwt. with nitrate of lime.

These results however do not allow of any positive valuation of the residual effects of cyanamide.

Belgium

EXPERIMENTS IN BELGIUM. — Of great interest at the present moment are some experiments in pots recently carried out by Professors A. Grégoire and J. Hendrick at the Station for agricultural chemistry and physics at Gembloux (1). These experiments were made on timothy grown in ferruginous sand, and the following preparations were applied and compared with sulphate of ammonia and shoddy: cyanamide, leather ground and roasted, crude ammonia salts, the waste products from these, and the ferrocyanide contained therein.

Cyanamide showed less effect on the timothy than sulphate of ammonia and shoddy.

If we take the ratio:

$$\frac{\text{Increase of produce} \ldots}{\text{Utilisation of the nitrogen}} = \frac{100}{100} = 1$$

for sulphate of ammonia, then the ratio for wool is $\frac{87}{73} = 1{,}19$, and for cyanamide $\frac{73}{75} = 0{,}97$. This weaker effect of the cyanamide appears to arise not from any decrease in the nitrogen supplied to the plant but from a slightly injurious effect of the manure.

France

EXPERIMENTS IN FRANCE. — The chief conclusions reached by the latest researches of Malpeaux have been already reported in this *Bulletin* (18); we shall now add some figures indicating the results obtained per acre in field experiments:

	Oats: net profit			Sugar-beets: sugar	Potatoes: net profit			Swedes: net profit			Poppies: net profit		
	£	s	d	cwt.	£	s	d	£	s	d	£	s	d
Control	—			30 ½	—			—			—		
Nitrate of soda	1	6	4	36	5	7	10	—	10	0	—	10	3
Nitrate of lime	1	9	6	38 ¼	4	19	9	1	3	1	—	4	4
Sulphate of ammonia .	1	16	11	37 3/4	5	15	6	—	1	0	—	16	8
Cyanamide	2	2	0	40	4	12	5	—	8	8	1	5	8

These figures show that cyanamide and sulphate of ammonia gave the best results, nitrate of soda and nitrate of lime having probably been carried away by the heavy rains of the year (1910). The same year, Saillard (5) obtained like results with sugar beet. The following are his figures:

	lbs. per ac	Yield per ac. tons cwt	Sugar per ac. cwt.
Nitrate of soda . . .	267	10 13	33 ½
Cynamide	267	10 10	33 ½
Nitrate of lime . . .	308	11 2	35

Spain

EXPERIMENTS IN SPAIN. — Marti and Maylin have conducted a series of remarkable experiments in the irrigated soils of the experimental Farm School at Valentia (6). The following average results have been obtained from three different experiments:

		Wheat		
	Onions cwt.	Grain cwt.	Straw cwt.	Rice cwt.
Nitrate of soda	352 ½	11 ½-13	21 3/4 -28 ½	—
Nitrate of lime . . .	364	—	—	—
Sulphate of ammonia .	375	10 ½-12 ½	20 3/4 -28 ¼	65 ½
Cyanamide	356 ½	10-12 ¼	20 ¼-27 3/4	64-66

The chief conclusions bearing on the case under consideration are:

1. Crops of slow growth, or of a long vegetative period, use cyanamide to the same, if not to a greater, extent than sulphate of ammonia.

2. On the other hand crops of rapid growth use cyanamide to a less extent than sulphate of ammonia, owing to the slower nitrification of the former.

Germany

SPECIAL CROPS. — The use of cyanamide, is of special interest with reference to the improvement and cultivation of marshy and peaty soils and also with reference to certain special crops, such as woody plants and rice, a point hitherto little considered.

As regards the use of cyanamide in peaty soils, Professor Tacke's researches are of great importance. They were carried out at the Moor-Experiment Station of Bremen (7).

First come two series of comparative experiments in soil already cultivated, and in improved soil:

	lbs. of Nitrogen	Oats Cultivated soil grain	 straw	 Improved soil grain	 straw
		cwts. per ac.		cwts per ac	
No nitrogen	—	9 ½	14 3/4	3 3/4	5 ¼
Nitrate of soda	40	19	29 3/4	16	23 3/4
Nitrate of lime . . .	40	—	—	18	26 ½
Sulphate of ammonia . .	40	16 ¼	27 ½	15 ½	22 ¼
Cyanamide	40	15 3/4	26	12	18 ¼
Lime-nitrogen	40	15	24	12 3/4	18 ½

The following are results obtained in a sandy heath soil:

		Oats cwts per acre grain	 straw
No nitrogen		8 ½	11
Nitrate of soda	20 lbs. nitrogen .	11	15 3/4
» » »	40 » » .	12 ¼	19 3/4
Cyanamide	20 » » .	11 ½	17
»	40 » »	12	17 ¼

The cyanamide was applied 14 days before the sowing.

Sweden

H. v. Feilitzen confirms that in peaty soils with little nitrogen, cyanamide is less efficacious than nitrate of soda, and that as a rule cyanide nitrogen is of less effect than nitric nitrogen.

The experiments were carried out at the Experimental Station of the Swedish Moor Culture Society at Flahult (8). In these the action of cyanamide produced 30 % of the yield of grain obtained with nitrate of soda and 50 % of the yield of straw. The time of its application was immaterial.

Italy

For woody plants, as was to be expected, cyanamide has generally given satisfactory results. A series of experiments recently carried out in the most important viticultural zones of Piedmont (9), has proved the value of cyanamide for vines. In an experiment made on groups of 150 vine stocks, treated with 66 lbs. of manures containing an equal amount of nitrogen, the following results were obtained:

	Grapes from 150 Stocks lbs.
Nitrate of soda	475
Cyanamide	543
Control	382

In the three lots the percentage of grape-sugar was 17.

Hawaii

It seems now well established that cyanamide is suitable for rice. Already at the Hawaii Agricultural Experiment Station the advantage of a nitrogenous manure for rice had been proved, and the relative superiority of sulphate of ammonia over nitrate of soda (10). At the same time the advantage of cyanamide was also proved, the excess over the controls being:

Sulphate of ammonia	37-67.7 %
Cyanamide	15.8-32.2 %
Nitrate of soda	6.4-19 %

Italy

These results have been confirmed by the experiments carried out in Spain, as above described; and they are also confirmed by a series of experiments made on a large scale for the Experiment Station of rice culture at Vercelli (11). The results per acre were as follows:

Manure (besides mineral supers, 3 ¹/₄ cwt.)	Gross return, less cost of manure		
	£	s	d
Hoofs and horns, 210 lb.	10	13	7
Sulphate of ammonia, 145 lb.	10	17	6
Cyanamide, 186 lb.	10	10	9
Hoofs and horns, 89 lb Sulphate of ammonia, 74 lb.	11	1	5

As the cyanamide and sulphate of ammonia are practically of equal value, the rice cultivator may use either according to his convenience.

Germany

Use in Practical Agriculture. — As a whole the practical results obtained by Müntz and Nottin have been confirmed. It appears certain that cyanamide does not injure germination, at least when a normal amount is applied.

If a larger amount be used, it would be wise to drill it in before sowing, as the following results, obtained by Prof. Tacke, show:

Calcium cyanamide	Oats, cwts per ac. grain	Oats, cwts per ac. straw
20 lbs. nitrogen, 14 days before sowing .	11.60	17.10
20 » » 8 » » .	11.43	15.87
40 » » with the seed .	9.94	13.61
40 » » 14 days before sowing .	11.96	17.28
40 » » 8 » » » .	11.34	16.03
40 » » with the seed .	10.09	14.52

Moreover, even as a top dressing, cyanamide appears to give good results, when used in normal quantities of from 1 to 2 cwt. per acre.

England

In the experiments made at Woburn the calcium cyanamide used as a top dressing slightly burnt the leaves of the oats, but the plants quickly recovered.

In any case there seem to be no drawbacks in connection with woody plants. Recent experiments conducted by the laboratory of agricultural chemistry at the Higher School of Agriculture in Milan appear to have demonstrated that cyanamide, if used with due precaution, has no harmful effect on the growth of the olive (12).

Italy

Further, from the latest experiments, the general rule may be deduced that cyanamide, to give a satisfactory result, requires soils with sufficient clay (16) (17), especially if they are poor in lime.

A recent result of two series of experiments carried out under very different conditions, points to the desirability of its being applied together with other nitrogenous manures.

In fact, in the experiments made in Spain and described above, the best results were obtained with wheat as follows: cyanamide was applied in the autumn (9 lbs. of nitrogen), the wheat was then sown, and in the spring nitrate of soda (18 lbs. of nitrogen) was applied. Also at the Central Institute for Agricultural Experiments in Stockholm, where experiments were made in pots, the best results were obtained with oats, when a mixture of two parts of cyanamide and one part of nitrate of lime was mixed in before the seed was sown.

Sweden

The yield in grain was more than half as much again as that obtained with nitrate of soda. Next in value to this came a mixture in which the cyanamide and nitrate of lime were equal. These facts merit investigation by further experiments.

Lastly one of the greatest practical difficulties is the fact that hitherto no product has ever been supplied of a constant uniform quality, and such as to give complete satisfaction as a good manure and easy to spread (14). Hence it is that this product is always under discussion, whereas calcium cyanamide of good quality would constitute a possible nitrogenous fertiliser, if wisely used and prepared in such a way as to prevent injury to the health and sight of the labourers when spreading it. For this purpose it is advised to mix with the cyanamide animal, vegetable, or mineral fats, in small proportions, sufficient to hold the powder (18).

Passing over provisionally the question of the industrial transformation of cyanamide into ammonia, we may say in conclusion that manufacturers should at present direct all their efforts to supplying a product which is uniform and easy to apply.

GENERAL CONCLUSIONS.

1. In principle, cyanamide may be compared with sulphate of ammonia as a manure, its value varying from 60 %, of that of the latter to more than 100 %.
2. For certain crops the manurial value of cyanamide exceeds that of nitrate of soda, and is practically equal to that of sulphate of ammonia, as for instance for rice.
3. Cyanamide gives the best results in fairly good soils, particularly clay soils relatively poor in lime and nitrogen. It is unsatisfactory for poor sandy and marshy soils.
4. Although its caustic action on herbaceous plants is generally only temporary, it is desirable to drill in the cyanamide to a depth of from 2 to 4 in. two weeks before sowing, rather than to use it as a top-dressing.
5. The amount used should be from 22 to 45 lbs. of nitrogen, that is (at 20 %) 1 to 2 cwt. of cyanamide per acre.
6. It is probably very desirable to turn in a mixture of nitrate of lime and cyanamide in the autumn, or else to turn in the cyanamide in the autumn, and spread the nitrate as a top-dressing in spring.
7. The best time for application appears to be before or immediately after rain.
8. In applying it, all lumping should be avoided. It must be distributed with the greatest possible regularity, and intimately mixed with the soil.
9. The product supplied by the market must be as uniform as possible; and it is desirable that it should be treated with a small percentage of fatty substances.

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(18) See also this *Bulletin:* Nov. 1910, pp. 35-36; Dec. 1910, pp. 231-232; Jan. 1911, No. 72; Feb. 1911, No. 414; March 1911. No. 831; June 1911, Nos. 1694 and 1695; July 1911, No. 2093; Aug.-Sept.-Oct. 1911, No. 2518, and Feb. 1912, No. 308.

WILSON, JAMES (U. S. Secretary of Agriculture). **Fertiliser Resources.** — *Report of the Secretary of Agriculture, 1911,* pp. 162 (106-108). Washington, 1911. **492**

United States

The United States Government having considered the question of fertilizers to be one of public importance, as being bound up with industrial and commercial interests, has taken part of the responsibility of supplying them into its own hands. The question has two sides, both of which are being carefully considered by the Ministry of Agriculture:

1) To find fresh sources of fertilising substances, explaining the ways and means of preparing them for agricultural use.

2) To make known the value of chemical manures when wisely administered.

As an aid to the solution of the first problem, the last Session of Congress voted funds for the exploration and investigation of possible natural deposits of fertilising materials.

During the first six months thus employed the discovery was registered of certain areas at present productive, and of others secured for future use in the extraction of phosphatic minerals. (1)

At the same time the investigations provided excellent food for study in the way of improvement in the methods of extraction, manufacture and sale of the various products (2). And it seems besides that the discovery of new deposits is continually being announced and that the resources of phosphatic minerals hitherto known in the United States are sufficient to remove all fear of their becoming exhausted.

As regards nitrogenous fertilisers, although attention has been drawn to possible deposits of nitrates in the arid and semi-arid regions of the United States (3), still, when they do exist, they are either too small to be utilised from a commercial standpoint, or too inaccessible to means of transport or manufacture, or else are of doubtful economic value. But, although the utilisation of such deposits is still an open question, it is nevertheless worth while to take their existence into account. Among other investigated sources of nitrogenous fertilisers, it seems there is a strong tendency to introduce coke stoves into the principal carboniferous regions; so that considerable quantities of sulphate of ammonia, hitherto unnoticed will be rendered available for use.

Special interest has been shown in the study of potassic manures, in consideration of the fact of depending on the German product and the obvious advantage of one that is local and American. The following are considered to be among the possible sources of potassium:

a) The immense accumulations of saw-dust in the timber-producing regions.

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(1) See *B*. Aug.-Sept. Oct. 1911, No. 2520.

(2) See *B*. March. 1911, No. 776.

(3) See *B*. Feb. 1911, No. 309. (*Ed.*).

b) The refuse of sugar-factories.

c) Water used in washing wool.

d) Possible deposits lying below existing deposits of rock-salt, or under the present surface of dried-up seas or lakes.

e) Natural silicates of potassium.

f) Seaweeds.

The three last sources are worthy of special consideration.

The basins of dried-up regions are now explored by Government agents for the purpose of taking note of possible surface deposits of potash, or nitrates.

With regard to natural potassic silicates, extensive deposits of them exist in the United States, such as feldspars, glauconites, leucites; and the chemical laboratories of the Ministry of Agriculture and of Agricultural Institutes, as well as private enterprise, are all making serious enquiries as to the possible methods of extracting potassium. But the amount of energy required to separate the chemical combinations of such materials and extract the potash, is so great that for the present at least it makes the production prohibitive. Only the very cheapest form of energy, whether generated by electricity or heat; or the production of secondary products of low value (cement) (1) can render it possible for potassic silicates to be utilised commercially.

But the most promising source of potassium is that of the immense extents of seaweed (kelp) along the Pacific coast. From the careful estimate made after the earliest investigations, this growth of seaweed apparently covers an area of 100 sq. miles (2) and is capable of yielding 1 000 000 tons of chloride of potash worth $35 000 000, about three times the amount of the present importation of salts of potash. And the development of this growth would in nowise be compromised by the present crop being gathered.

Besides this, innumerable other areas of similar nature remain to be investigated and made known. With regard to the methods of gathering and treating the raw material, there are still many mechanical difficulties to overcome; but the fact, certified by public laboratories, that iodine and other useful products may be extracted from the seaweeds under consideration, will pave the way for their being gathered for the extraction of potash. (3)

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(1) B. HERSTEIN. Potash from Feldspar. *The Journal of Industrial and Engineering Chemistry*. Vol. 3, N° 6, pp. 426-428; Easton, Pa. June, 1911.

(2) In the bays of the north-western part of the State of Washington.

(3) See *B*. Jan. 1911, No. 69. (*Ed.*).

The report of this work ends by pointing ont that the certified facts of possible resources of fertilising matters in the United States and the ever increasing need for them render the eventual utility of such investigations so great that the cost is inconsiderable; consequently it is well worth while to provide ample funds for their continuation.

AGRICULTURAL BOTANY.

CHEMISTRY AND PHYSIOLOGY OF PLANTS.

493 BIRGER, KAJANUS. **On the Germination Energy of Red Clover Seed.**— (Über die Keimenenergie des Rotkleesamens). — *Landwirtschaftliche Jahrbücher; Zeitschrift für wissenschaftliche Landwirtschaft,* Band XLI, Heft 3-4, pp. 527-533. Berlin, 1911.

Sweden

This article gives an account of the results of much research and of many experiments undertaken for the purpose of determining whether the different coloration of the seeds of red clover has any relation to their power of germination.

Of each type of red clover three lots of seeds were selected: violet, yellow and brown respectively, each containing 200 seeds which were placed on germinating beds of filter-paper and felt; these were covered with bell-glasses perforated at the top and kept moist by means of a wick placed in a vessel of water. The temperature was kept between 18° C and 30° C. The data furnished by these experiments are incorporated in a table, and the results may be summarized as follows:

1. Violet seeds are much heavier than yellow or brown.
2. Brown seeds have less germinating power than violet and yellow.
3. Brown and yellow seeds do not differ much in weight.
4. Yellow and violet seeds germinate almost equally well, but the yellow seeds are always somewhat inferior to the violet.

The percentage of hard seeds varies greatly, but the number of such seeds is, on an overage, least among the violet, and greatest among the brown, which explains the fact that the latter germinate much more slowly. No definite relation however appears to exist between weight and germinating power: the yellow seeds which were lighter than the violet, nevertheless, germinated in five cases faster than the latter.

Other experiments made with seeds from different localities show that germinating power and the percentage of hard seeds are very variable and, apparently, have no connection with the colour.

The slow germination of the brown seeds doubtless depends upon a chemical change in the testa. It cannot be absolutely denied that there is some correlation between germination and colour, since the former depends, not only on the anatomical structure, but also upon the chemico-physical properties of the testa.

What these properties really are, and their relation to colour, cannot yet be determined with any certainty.

PANTANELLI, E. and SEVERINI, G. **The Ammoniacal Nutrition of Green Plants.** (Ulteriori esperienze sulla nutrizione ammoniacale delle piante verdi). — *Le Stazioni sperimentali agrarie italiane*, Vol. XLIV, F. 11-12, pp. 873-908. Modena, 1911. **494**

Italy

Experiments in growing spring wheat and white mustard in calcareous sand to the point of seed-bearing and maturity. All the nutritive elements were given to the various cultures in the same quantities, except the anions combined with ammonia (chlorine, phosphoric, succinic, tartaric, citric); further the experiments were carried out with carefully sterilized soil, so as to exclude any possibility of nitrification.

The results obtained confirmed the previous experiments which were made with young plants and which led to the following general conclusions :

1) Nitric nitrogen, in the case of wheat and mustard, caused the maximum vegetative growth (stalks, leaves, etc.) but sometimes one ammonium salt, sometimes another, had a greater effect upon the production of seed.

The injurious effects of the exclusive absorption of ammonium were caused by the salt of the strongest mineral acid, the chloride; the citrate had the same effect in the case of the mustard. The diammonium phosphate again showed its great nutritive value, which in the case of the two plants, was little inferior to that of the nitrate.

The three soluble organic ammonium salts gave rise in the case of the wheat to good fructification and to a fair vegetative growth; they were not so beneficial to the mustard, by which even the citrate was not assimilated.

The four insoluble double salts of ammonium (with magnesium, calcium, ferrous iron and manganese) also proved to be of much nutritive benefit to the wheat, but they had less effect upon the mustard, especially with regard to vegetative development. Further, this plant made no use of the ammonium-magnesium phosphate.

The reasons of the different behaviour of the two plants are:

a) The weaker acid secretion of mustard roots, which hindered the action of the insoluble phosphate.

b) Large reserves in the wheat grain and the development of a strong root-system, which produced a need of nitrogen and caused the rapid disintegration of the solid components of the soil.

2) The best utilization of nitrogen in the formation of dry matter by the wheat proved to be obtained with organic salts of ammonium in the first place, with insoluble phosphates of ammonium in the second, and lastly with the nitrate, to which, from this point of view, only ammonium phosphate and ammonium chloride proved themselves to be inferior.

The nitrogen content varies generally inversely to the development, and the large amount of this element was the index or a cause of sterility in wheat. The mustard was able to make more use of nitrogen absorbed in the ammoniacal form than in the nitric as far as the dry matter of the vegetative parts was concerned, and this plant produced with the former a much larger quantity of seeds rich in nitrogen; but as the mustard grows more rapidly and develops more before bearing seed, when supplied with nitrate, it follows that the absolute amount of nitrogen absorbed, and of dry matter produced, is greater in this case. Soluble phosphorus and the organic salts of ammonium promote the formation of albumen more readily than nitrate in both wheat and mustard.

3) The absolute quantity of water which is transpired varies in proportion to the development of the plant.

The transpiration unit, that is to say the amount of water given off by a given mass of the transpiration organ, depends on the activity of root-absorption.

Thus, chlorine in the case of the wheat, and the organic acid radicles in that of the mustard, were absorbed more slowly than ammonium and caused an increase of osmotic pressure, thus lowering the root-absorption and, as a result, decreasing the transpiration.

The utilization, in the construction of organs, of the water absorbed was generally better when the plants were furnished with ammoniacal nitrogen.

4) To sum up: ammoniacal nitrogen has, in itself, a higher nutritive value than that possessed by nitric nitrogen, but it can only be utilized under the following conditions, when:

a) the ammonium cation is absorbed slowly by the roots;

b) the ratio between the rates of absorption by the roots of ammonium and of the accompanying anion approaches 1;

c) the anion itself has a nutritive value.

The two last factors have naturally a specific character. Further experiments are being made with fewer compounds of ammonium and a greater number of species of agricultural plants.

The researches were carried out at the Botanical Institute of the Royal Institute of Agriculture at Perugia, and the analyses were made in the Royal Station of Plant pathology in Rome.

BERNANDINI, L. and MORELLI, G. **On the Physiological Rôle of Magnesium in Green Plants.** (Sull'ufficio fisiologico del magnesio nella pianta verde). — *Rendiconti della Società Chimica Italiana.* Serie II, Vol. III, Fasc. XIII, pp. 349-353. Roma, 25 Gennaio 1912. **495**

Italy

In a preceding note, it was shown by one of the authors that the assimilation of phosphoric acid by green plants is determined by the relative amounts of magnesium which have been absorbed in conformity with the ratio $\frac{\text{lime}}{\text{magnesium}}$: phosphorus pentoxide, which is present in the economy of higher plants.

In a more recent note on the composition of the rice embryo (1), after having drawn attention to its high content of phosphorus in the form of phytine, the writer shows, from data obtained from analysis, that the phytine in the rice embryo is in the form of the magnesium salt of phytic acid, although usually considered to be the magnesium-calcium salt.

The presence of relatively large quantities of phosphorus in the form of the magnesium salt of phytic acid, which is easily hydrolised by enzyme action, leads to the conclusion that phytine is the form in which the plant stores up the reserve of phosphoric acid which is transported in the form of magnesium phosphate.

In the present researches, the investigators observed in wheat germinating in darkness, and also in light, the evolution of organic phosphorus and that of magnesium compounds in the form of salts of organic and inorganic phosphorus.

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(1) See *B.* March 1911, No. 738. (*Ed.*).

From analysis, the following results were obtained:

1) During germination in darkness, the phosphorus of the compounds of organic phosphorus, known as phosphatides, and the phytic phosphorus, continually decrease, and the destruction of the phytine follows the progress of enzyme action; at the same time, the phosphorus soluble in 1 % hydrochloric acid remains relatively constant.

2) In germination in darkness, the magnesium soluble in 1 % hydrochloric acid remains relatively constant, while that which is soluble in water increases with the decrease of the phytic phosphorus.

3) In germination in light, when the young plant begins to become green, the phosphorus in the form of phosphatides commences also to increase, while the phytic phosphorus does not; under the same conditions, the magnesium soluble in water increases at first, but begins to diminish on the appearance of the chlorophyll.

Thus it is proved, that the transport of reserve phosphorus to the parts where it is utilized, and where synthesis takes place, is effected by means of the magnesium, showing that the latter plays a very important part in the economy of the green plant. The magnesium renders the phosphoric acid transportable, and carries it from the reserve store to the places where synthesis is carried out, where this acid is utilized in the formation of the plastic phospho-organic substances which constitute the cell, while the magnesium is employed in the construction of the chlorophyll molecule.

SELECTION.

496 LEHN, D. **A Contribution to the Question of Correlation in Rye.**— (Ein Beitrag zur Frage der Korrelationen bei Roggen). — *Illustrierte Landwirtschaftliche Zeitung*, 32. Jahrgang, Nr. 3, pp. 13-14. Berlin, 10. Januar 1912.

Except in the case of the sugar-beet, we have, at present, as far as correlation in cultivated plants is concerned, to rely chiefly upon hypotheses.

Germany The clear establishment of the existence of correlation, and the relation between correlated characters is of great importance, not only from the scientific standpoint, but also from the practical. Hence the value of the present article which gives the results of numerous researches on the correlative characters of rye.

The figures are taken from the breeding registers of C. Krafft-Buir and refer to Zeeländer rye, which this investigator has improved by means of a system of individual selection carried out for ten years. The extraordinary tendency to variation shown of late years, and the correlation (visible even to the naked eye) between certain morphological characters, caused him to investigate the data mathematically. For the year 1908, the figures refer to 62 plants divided into three groups according to length of straw: 1) short, up to 140 cm. (55 in.); 2) medium, 140-150 cm. (55 to 59 in.); 3) long, more than 150 cm. (59 in.). The relation existing between length of straw and other characters is shown in table No. 1.

Length of straw is accompanied by longer ears, more internodes, increased weight of grain per ear and per thousand; while on the other hand, the total weight of the plant, the number of haulms, and the weight of grain per plant diminish. In 1909 there was more material at disposal. The data refer to 132 plants, divided into three groups, according to the length of the straw: up to 130 cm. (51 in.); 130-137 cm. (51 to 54 in.); above 137 cm. (54 in.). The results (see table) established clearly the relation between length of stalk and number of grains per ear, which could not be done with certainty the preceding year.

The researches conducted in 1910 and 1911 led to the same conclusions.

When from the material used in the four years, we take the average of each of the three groups, the correlation of the single characters comes out clearly.

Increase in straw-length is directly correlated with:

1) Length of ear.
2) Number of internodes.
3) Weight of grain per ear.
4) Number of grains per ear.
5) Weight of 1000 grains.

While the following characteristics are in inverse relation to the straw-length:

1) Weight of plant.
2) Number of haulms.
3) Density of ears.
4) Weight of grain per plant.
5) Percentage of grain.

It would be interesting to find out whether these facts also apply to other cultivated types of rye; experiments in this direction would show whether the above mentioned correlation applies only to " Zeeländer ", or admits of a more general application.

	Number of plants	Medium length of haulms in feet	Weight of plant in grams	Number of haulms	Length of ears in inches	Number of internodes	No. of spikelets on 3.93 inches of ear	Weigt of Grain in grams per		Number of grains per ear	Weight of 1 000 grains in grams	Percentage of grains
								Plant	Ear			
Short plants	21	4.32	29.7	6.3	0.43	5.2	32.4	13.3	2.2	62.1	35.4	44.8
Medium »	23	4.72	25.7	5.2	0.43	5.3	32.3	11.9	2.2	60.4	36.9	44.2
Long »	18	5.02	24.3	4.4	0.45	5.4	31.0	10.2	2.3	62.9	37.3	42.4
Short plants	45	3.91	32.7	7.7	0.38	4.8	32.6	14.2	1.9	54.1	34.9	43.9
Medium »	35	4.39	31.5	6.8	0.41	5.1	30.9	13.8	2.1	55.4	36.6	43.0
Long »	54	4.69	33.8	6.7	0.44	5.1	30.1	14.0	2.1	57.9	36.5	41.3
Short plants	73	4.18	33.3	6.7	0.44	5.1	31.4	13.8	2.1	59.1	36.7	42.4
Medium »	62	4.53	30.9	5.9	0.44	5.2	31.1	12.4	2.2	59.9	36.6	41.1
Long »	77	4.84	31.6	5.5	0.46	5.3	31.2	12.5	2.3	60.8	37.6	40.2
Short plants	41	4.26	31.5	6.4	0.40	4.7	32.0	13.4	2.1	56.8	37.5	42.3
Medium »	30	4.51	29.6	5.7	0.40	4.7	32.7	12.7	2.2	58.9	36.9	42.6
Long »	49	4.76	28.3	5.3	0.42	4.9	31.3	11.7	2.2	59.7	39.7	41.3
Short plants	178	4.17	31.8	6.5	0.41	4.9	32.1	13.7	2.1	58.0	36.1	43.3
Medium »	150	4.54	29.3	5.9	0.42	5.1	31.7	12.7	2.2	58.6	36.7	42.7
Long »	198	4.83	29.5	5.5	0.44	5.2	30.9	12.1	2.2	60.4	37.8	41.1

Cook, O. F. Dimorphic Leaves of Cotton and Allied Plants in Relation to Heredity. — *U. S. Dept. af Agric., Bureau of Plant Industry, Bull.* No. 221, pp. 59, figs. 17, pls. V. Washington; November 22, 1911. 497

United States

The most important of the general facts or principles of heredity that may be illustrated by the phenomena of dimorphism is, the fundamental distinction between expression and transmission. Unless this distinction is appreciated it is impossible to understand the measures of selective breeding that are required to preserve the uniformity and maintain the agricultural value of superior varieties of cotton and other seed-propagated crops.

The facts of heredity that promise to be of most value from the standpoint of agricultural application are facts of expression. Even without determining the mechanism of transmission it is possible to investigate the effects of breeding and environment upon the expression of characters.

If there were a complete correspondence between expression and transmission, the characters of a pure-bred uniform variety might be expected to remain fixed for all time, and further selection would be entirely unnecessary. But in reality such is not the case, and the appearance of new characters is frequently recognized, even in plants reproduced vegetatively.

The development of any individual plant may be viewed as a progressive change of expression of characters, the juvenile characters giving place to the adult; but the changes are generally so gradual as to suggest no analogy with the Mendelian form of definitely contrasted alternative inheritance. In the case of cotton and Hibiscus, however, it appears that Mendelian relations exist in characters that are also subject to abrupt change during individual development. The same characters that show contrasted expression in Mendelian hybrids may be as definitely contrasted, in related plants, in the growth of each individual. Mendelism, like the dimorphic differences, may be looked upon as representing alternative expression of characters.

A very pronounced example of dimorphism of leaves has been observed in *Hibiscus cannabinus*, the so-called. Deccan hemp, in Egypt. The leaves of the upper part are deeply tripartite, while the lower ones are entire. These variations show a curious parallelism with those in cotton: the ordinary Upland varieties have entire leaves, while the " Okra " varieties have them deeply trilobed.

The Hibiscus leaves show a very abrupt transition from one form to the other; and it has been found that Mendelian segregation of the broad and narrow forms of leaves occurs in the second generation of crosses between varieties of cotton representing the two types of leaves. The hemp plants with the two kinds of leaves represent a segregation of characters among the internode members of the same plant. It is possible that the different forms of the leaves may be connected with the fact that there is a difference of function among the internodes of the stalk.

The internodes of the upper part of the stalk produce fruit or fruiting branches, while those of the lower part do not. Some of the lower internodes of the cotton stalk give rise to large vegetative limbs with the same functions as the stalk, while other internodes produce only small abortive branches or none at all. Several of the barren internodes usually intervene between the highest of the vegetative limbs and the lowest of the functional branches, as though it were difficult to change abruptly from one form of branch to the other.

In Deccan hemp and the okra plant (*Abelmoschus esculentus*) the fruits are borne directly at the axils of the main stalk without the intervention of fruiting branches. It may be that the divided leaves indicate in advance the internodes that are to produce flowers and fruit. The nodes of the stalks of the cotton-plant may thus be considered dimorphic because of the two types of branch they may produce.

In Upland varieties of cotton the fruiting branches are produced closer to the base of the plant than in the Egyptian cotton, and the seedlings of Upland cotton also begin to produce lobed leaves at earlier stages than Egyptian seedlings.

There is then a general parallelism between the leaf-variations occurring in numerous species and varieties of cotton and those of certain other plants.

The definite changes of characters involved in passing from one form of leaves or branches to another are analogous to the abrupt transformations that take place in mutative variations.

Dimorphic differences and mutations show that abrupt changes of characters are to be considered as phenomena of alternative expression. It is obvious that such changes are not determined by alternative transmission, as often alleged for Mendelian segregation of contrasted characters.

The same kinds of characters show dimorphic specialization in individual plants and Mendelian segregation in hybrids. Dimorphism and Mendelism may both be interpreted as phenomena of alternative expression.

The general interest of such phenomena is in their relation to the recognition of a fundamental distinction between transmission and expression as a general law or principle of heredity. The facts of heredity and breeding can be better understood if transmission be considered as including the whole ancestral series of characters. Transmission inheritance is a comprehensive process, while expression inheritance is partial and alternative, different characters being expressed in different individuals or in different stages of individual development.

The facts of dimorphism are worthy of being taken into account in breeding, as one of the means of recognizing variations from the standard or typical form of a select variety.

Though different kinds of leaves or branches represent very different facts of heredity, yet the expression of such characters can be influenced by external conditions. Thus it has been found that new conditions may seriously disturb the expression of characters in the cotton plant, even to the extent of a complete suppression of the fruiting branches.

For the purposes of the selection that has to be maintained in order to keep a superior stock in a condition of uniformity, it is very important to recognize varieties by the characters of their leaves and branches. Indeed, selection by vegetative characters can be made even more efficient than selection by fruit characters because it enables degenerate variations to be recognized and removed early in the season, thus avoiding the danger of spreading inferior characters through cross-pollination.

Selection is our means of keeping undesirable characters from coming into expression, but it does not prevent their transmission, Even though all the lines of descent that show tendencies to the expression of undesirable characters be rejected, the possibilities of such expression remain in the other lines and are likely to be reawakened if selection be relaxed. One of the most important problems in the selective breeding of cotton and other seed-propagated field crops is to make selection more efficient by more adequate knowledge of the characteristics and behavior of the plants, so that deviations from a type can be more easily recognized and removed from the stock and the exciting causes of such deviations avoided.

CEREAL AND PULSE CROPS.

498 OLIVA, ALBERTO. **Yields of Wheat in Mountain Regions.** (In montagna si possono ottenere delle alte produzioni di frumento?) — *Relazione di un concorso a premi fra i coltivatori di frumento del Circondario di Borgotaro (Parma) nell'annata 1910-1911,* 1 Opusc., pp. 24. Parma, 1911.

Italy

The Borgotaro section of the Travelling Lectureship of Agriculture of Parma opened a prize competition among wheat growers of the district in the autumn of 1910, in order, by means of extensive experimental fields to give practical demonstration of the possibility of growing profitable crops of wheat in mountain regions.

The regulations for the competition are here briefly given.

1. Extent of the field to be not less than $^4/_5$ of an acre.
2. The field to be in rational relationship to the artificial meadow (lucerne or clover).
3. The judges will examine the sections in competition at repeated intervals, as well as being present at the cutting and threshing of the wheat.
4. The verdict given will be guided

a) by the rotation adopted ; *b*) by the preparation of the soil ; *c*) by the manuring ; *d*) by the choice and preparation of the seed ; *e*) by care in cultivation.

The stipulation made by the promoters of this competition, *viz.* that the average production should be 20 qls. per ha. (30 bu. per acre), was more than fulfilled.

In the Mid-Apennine district of Borgotaro, in soil of normal situation and fertility, more than 30 qls. per ha. (45 bu. per acre) were produced with ordinary care, in 1911.

These figures and results give every reason to consider the question as to the possibility of obtaining a rich harvest of wheat cultivated in mountain valleys even at a height of 800m. (2630 ft.) above the sea, to have been satisfactorily answered by proved facts.

The rotation of crops in the Apennines has hitherto been limited to the disastrous alternation of maize and wheat ; disastrous because it impoverishes the soil, tending to lower the production of wheat and prevent the production of maize. This is in fact the rotation of 5 or 6 qls. per ha. (7 ½ to 9 bu. per ac.) of wheat, which led to the condemnation of wheat growing in the mountains. That is why the rotation lucerne or clover (chemically manured) and corn has been insisted on for the Apennines. That this change has been beneficial is proved by facts. Wheat after lucerne began, more than ten years ago, to produce twice the former amount, viz. 12 qls. (17 bu.) which has increased to 15, 20 and 30 qls. (22,30 and 45 bu.). The preparation of the soil for wheat hitherto adopted was a consequence of the old maize — wheat rotation; the soil was ploughed in October with a little wooden plough and the seed sown immediately after. But the farmers who took part in the competition ploughed or dug the ground thoroughly in August-September with what results the event proved. They used two excellent mountain ploughs, Sack W 10 and Melotte 2.

For chemical manuring only two mixtures were advised, which had long been used with the best results.

1. For wheat after manured leguminous plants.

Superphosphate (15-17 % P_2O_5) . . .	2 ½ cwt.
Nitrate of soda	¾ »

2. For wheat after non-manured leguminous plants.

Superphosphate (15-17 % P_2O_5) . . .	2 ½ cwt.
Sulphate of ammonia	¾ »
Sulphate of potash	½ »
Nitrate of soda	½ »

The varieties of wheat employed in these experiments were " Rieti " and " Gentile Rosso " and to a small extent " Cologna " and " Noè ". The " Gentile Rosso ", owing to its high yields — though it is subject to rust in the valley bottoms, is yearly gaining ground from " Rieti "; and its superiority has been incontestably confirmed by these experiments.

As regards seed, the local custom is to sow about 110 kg. per ha. (6 ½ pecks per acre), but in practice the tendency, and rightly so, is to increase this to 120 or 130 kg. (7 or 8 pecks), as oftener than not the seed was too thinly sown.

In face of the extraordinary results of this competition, it seems well to quote a few figures, in anticipation of the objection that if the production is considerable, so are the expenses.

By the mountain basehold system " mezzadria " (or land held on condition of proprietor's receiving one half of the produce) the bulk of the expenses incurred by the landlord consists in chemical manure

The land-tax and general expenses are always the same ; with this advantage, that a high rate of production is maintained by rational methods for the improvement of the soil. The landlord's maximum outlay for manure is roughly 59 lire per ha. (18*s* 10*d* per ac.) (1), against a minimum increase of crop, reckoning the landlord's share, of 5 qls. (7 $^1/_2$ bu. per ac.) of grain ; which, at 26 lire the quintal, gives a return of 130 lire per ha. (£2.1*s* 7*d* per ac.), this means a minimum profit of about 70 lire per ha. (£1.8*s* 3*d* per ac.) without calculating the value of the straw.

There is no doubt, continues the Author, that the profits of a well ordered system of agriculture carried on by the aid of oxen, would enable small mountain farmers to provide themselves with all the grain indispensible for their needs : but if this is possible and realisable in the future, the present general economical conditions of these farmers must be taken into account And it must not be forgotten that if wheat, which is already dear, has to be carried up to them, it will be at considerable cost.

But besides these special reasons of a social nature, there are other undeniable and peculiar agronomic conditions in mountain regions which render them more favourable than plains to the cultivation of wheat

In fact the cultivation of wheat in the mountains is necessary and inevitable. Necessary, because after the breaking up of the artificial meadows with their accumulated fertility, it would be difficult to grow any thing else in them but potatoes ; and indispensable for the existence of clover leys, which it is well-known cannot thrive for more than two years on the same soil.

It is, further, evident that mountain slopes being naturally well drained are less subject to damp and consequent cryptogamic diseases, as well as to lodging, as was shown by these tests.

The corn produced at an elevation of from 600 to 800 m. (2000 to 2600 ft.) in the Apennines (at Berceto, Bardi, Castelnuovo

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(1)

Superphosphate (3 qls.)	24 lire
Sulphate of ammonia (50 kg.)	15 »
Sulphate of potash (30 kg.)	10 »
Nitrate of soda (40 kg.)	10 »

and Pavallo), up to the extreme limit of the chestnut zone, is wonderful, both as to weight and nutritive qualities; the crops of spring wheat are especially fine and often finer than those of autumn, because the period of vegetation is prolonged by 30 or 40 days, thus increasing the nutritive power of the seed, just as in the case of northern countries, the classical home of cereals. In fact our mountains come within the range of those regions most fitted for the cultivation of wheat, in which it is doubtful whether the most fertile plains of Central and Southern Italy can be included, subject as they are to drought and intense summer heat.

In conclusion, when mid-mountain agriculture is based on artificial meadows and pastures (which have a mechanical action on mountain soil similar to woods, and like them tend to consolidate it) the cultivation of wheat becomes inevitable and indispensable, as under such conditions it is possible to obtain harvests as good as and even better and cheaper than can be produced in the plains.

The Cultivation of Barley in Tunis. (Culture des Orges en Tunisie). — *La Vie Agricole et Rurale*, No. 8, pp. 204. Paris, 20 Janvier 1912. 499

Tunis

Thanks to the absence of summer rains, Tunis has excellent barleys to put on the market, both from the point of view of appearance and that of preservation.

The production of barley for brewing purposes can be carried out in two ways:

1. By growing six-rowed barley selected from the local varieties and placed on the market with guarantees of homogeneity and cleanness.

2. By the methodical acclimatization of good kinds of two-rowed barleys introduced from their native countries.

In either case, the suggested improvement presents three phases:

1. Botanical separation of the kinds; comparative study of their cultural value; the search for new types which have appeared spontaneously, or are the results of hybridisation.

This work devolves upon the Experimental Station, and has largely been accomplished as far as the six-rowed barleys are concerned, and is in process of realization in the case of the two-rowed.

2. Trials undertaken in the different districts of Tunis of a certain number of pure races, in order to determine the most favourable conditions for each.

Researches as to the best cultural methods and fertilisers to use for the purpose of obtaining the highest yield compatible with the best industrial properties.

This last part of the problem has been studied by the Station in collaboration with a certain number of agriculturists.

3. Commercial organisation, which would make it possible for the producers to group together similar lots, and to furnish the trade with a homogenous product of determined composition specially grown for the purpose to which it is to be applied.

500 MIKHAILOVSKII, R. **Influence of Meteorological Factors on the Growth of Oats in the Year 1902.** (1) (Vliianie Meteorloghiceskikh Uslovii 1912 Godana Proesrastanie Ovzà). *Jurnal Opetnoi Agronomii* (Review of Experimental Agriculture), G. XII, pp. 925-926. S. Peterburg, 1911

Russia

The results are given of a series of observations made by the Author in the experimental ground annexed to the School of Obitoceask (Government of Taurida) for the purpose of determining the influence of meteorological agents on the growth of oats.

The growth of oats is considered to be divided into three distinct periods

1) From the moment of sowing to the appearance of the young shoots at the surface.

2) From the sprouting of the young plant to the forming of the ears.

3) From the forming of the ear to the harvest.

The second period determined the number of stalks, the development of leaves and the increase of organic matter in the tissues of the plant.

But external growth as well as that of organic substances is not determined by time, but rather by factors of a biological nature.

The third period was marked by accelerated development and precocious maturation caused by high temperature and want of rain during the flowering season as well as during formation of the grain.

It was noticeable too, that under equally unfavourable meteorological conditions, the plants that suffered most were those whose leaves were finest and most developed.

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(1) In spite of the fact that this article refers to observations made a long time ago, it gains considerably in practical interest as applicable to the great drought of last summer over almost the whole of Europe. (*Ed.*).

In brief the excessive heat and want of rain produced the following effects.

1) At harvest-time, 35 % of the ears contained either no seed at all or else it was imperfectly developed.

2) When the plant began to send up stalks 11.7 % of them were destroyed

And if we take into consideration that the loss at harvest-time, owing to the extreme lightness of the grains, amounted to 13-20 %, we shall see that the total loss owing to unfavourable meteorological conditions reaches 59.7 %.

The article is illustrated by numerous tables of dates and curves.

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HECKER, A. **Influence of Weather Factors on the Quality of Barley, Potatoes and Sugar Beet.** (Die Jahreswitterung in ihrem Einflusse auf die Beschaffenheit der Gersten, Kartoffeln und Zuckerrüben). — *Landwirtschaftliche Jahrbücher,* XLI. Band, Heft 3-4, pp. 417-526. Berlin, 1911.

Germany

The study of the action of weather factors on crops would be easy enough if it could be exactly ascertained what are the needs in the shape of light, rain, etc. of cultivated plants.

Reliable data in this connection are only available with regard to the factor "rain", and are due chiefly to the investigations of Remy.

The following table relates to barley; the particulars as to rainfall are those for Bonn, the climate of which represents the average general conditions of Western Prussia, Mecklenburg, Brandenburg, etc., a vast area where barley is grown for brewing purposes.

Periods	Water requirements of barley in tons per acre	Quantity of rain-water placed at the disposal of the plants in tons per acre	Surplus or deficit in tons per acre
From 15th March to 1st May	44	252	+ 208
From 1st May to 1st June .	456	336	— 128
From 15th July to 1st August	428	444	+ 16

Taking into account the comparative shortness of the period of growth, the water requirement is very high, especially during the period of growth in height.

Thus, while at the beginning of spring, when growth takes place at the expense of the moisture held in reserve in the tissues, the most important weather factor is temperature, at the end of spring and during summer the conditions of growth are directly influenced by the quantity of rainfall. The less clear and definite the action of any factor, the more that of other factors becomes accentuated and the more difficult is it to judge the effect of variation of the different factors.

The Author regards the nitrogen percentage of the caryopses as the index of larger or smaller yield and after a lengthy detailed discussion of the many meteorological, phenological and statistical data, he sets out the following interesting conclusions:

1. The weather during the last few weeks before ripening exerts a decisive action on the quality of malting barley. A dry and not very wet July is favourable; an over-wet July on the contrary unfavourably affects the quality of the grain. Excessive drought on the other hand results in incomplete ripening and increases the contents of albuminoids.

2. Moderate moisture, even less than the normal, accompanied by a rather low temperature, is the most certain guarantee of a good crop from the point of view of both quality and quantity.

3. Low temperatures and a feeble amount of sunlight are not detrimental to the formation of a good malting barley. Quite the contrary, it may be affirmed that cold in June and in July has an advantageous effect on the quality and likewise on the quantity of the grain.

4. Heavy rain showers, which are generally connected with a high temperature and high hygroscopic indications, reduce the contents of albuminoids.

5. The bad effect produced by excessive rainfall in July is very much mitigated when the weather at the same time remains cold and overcast.

6. The time of sowing does not appear to exert any specific action on the quality of the barley.

Influence of weather factors on the quality of potato tubers.

Periods	Water requirements of potatoes in tons per acre	Quantity of (rain)water at the disposal of the potatoes in tons per acre (Bonn)	Surplus in tons
From 15th March to 1st May	—	252	+ 252
From 1st May to 15th June	72	328	+ 256
From 15th June to 1st August . . .	292	444	+ 152
From 1st August to 30th September .	256	388	+ 132

From the very many data given, and considerations brought forward, by the Author, the following general conclusions may be drawn:

1. Excessively wet weather always influences the quality of potatoes unfavourably, especially at the time of flowering, when the tubers dovelop and the process of ripening is gradually taking place.
2. Over-dry weather reduces the quality and quantity of the potatoes. The quality especially suffers when the period of drought coincides with the first or second phase of growth (July).
3. Alternating dry and wet weather. A great deal of wet after a dry period is dangerous to quality, on the other hand the occurrence of drought after abundant rains unfavourably affects the quantity of the crop.
4. Changeable, cold and rainy weather during the second period of growth (in July for the medium and late varieties) does not seem to have any disadvantageous effect.
5. Low temperatures involve no risk to the good quality of the crop, if the other factors of growth (rainfall) are favourable
6. Hot, wet weather is detrimental to the quality of the tubers.

Influence of weather factors on the properties of sugar beet.

The following are the most important conclusions, drawn from the results of a large number of well conducted experiments, and based on abundant data:

1. Moderate rains from May to the middle of June, abundant from the middle of June to the beginning of August, moderate in August, scarce in September and October, produce a good crop of beet in point of quality.

The following table contains the particulars of the beet crop in Western Prussia and the Rhine provinces:

	Western Prussia		Rhenish Provinces	
	Average rainfall of 4 seasons in inches	Percentage of sugar in beets	Average rainfall of 4 seasons in inches	Percentage of sugar in beets
April	5.5	15.03	13.8	12.87
May	7.8		30.3	
June	14.2		22.8	
July	21.3		40.2	
August . . .	9.8		34.6	
September .	10.6		4.7	
October . .	10.6		34.2	

2. Plentiful rain from June to the beginning of August is indispensable to a good beet crop. It in some measure fosters an earlier growth in bulk of the crop and prevents this bulk growth from taking place in autumn, that is, at the time when it is desirable that quality should play the leading part.

3. Dry weather in August and September (up to the end of the vegetative period) or in September and October (till the harvest) improves the quality of the crop.

4. Wet weather before ripening or lifting, following on a dry, hot and sunny season, is disadvantageous to the quality of the crop.

5. A wet summer produces the same effects as indicated in No. 4.

6. Excessive rains in August and September or in September and October, and even in October alone, are always injurious; they deteriorate the quality of the produce.

7. Sunlight and temperature have only a very restricted effect on the crop value.

FORAGE CROPS. MEADOWS, AND PASTURES.

LANG, DR. H. **Promoting the Growing of Forage Crops in Districts of Small and Medium Farms.** (Die Förderung des Futterbaues in Gegenden mit Klein- und Mittelbetrieb). — *Illustrierte Landwirtschaftliche Zeitung*, 32. Jahrgang, Nr. 2. pp. 5-7. Berlin, 6. Januar 1912. **502**

Germany

The Agricultural Association of Baden and the Chamber of Agriculture for Baden in 1911 established an Advising Office in connection with forage crops, which is combined with the State Seed station of Hochburg, and is chiefly intended to supply farmers with indications in connection with putting down land to meadow or pasture. Together with the weekly Journal of the Association, a question sheet is sent out to farmers in the spring. This sheet contains all data which are of importance for the preparation of a mixture of seeds for a given piece of land (height above sea level, climate, slope, nature and moisture of soil, whether to be put down to meadow or pasture land, etc.). Farmers desiring advice fill up the question sheet and return it to the Advising Office. The latter then draws up a list of the most suitable forage seeds, and, in 1911, gave orders to various seed dealers to deliver the seeds in question to the farmer. The execution of these orders by the dealers leaving much to be desired in many instances, the Hochburg State Seed station will from 1912 onwards, prepare the seed mixtures itself and forward them to the farmers direct. By wholesale purchase and careful examination of the seeds, the Station, assisted by a grant from the Chamber of Agriculture, will be able to supply farmers with seed mixtures both good and cheap.

For the promotion of forage crops, the Author also advises that the State should, at suitable points throughout the country, carry out experiments in the cultivation of different forage plants, their manuring etc., in order to bring home forcibly to the small farmers everywhere, what can be done by skilful putting down and treatment of meadow and pasture lands.

503 REMY Prof. Dr. TH. **The Value of the Annual Rye Grass.** (Uber den Wert des einjährigen Raygrases). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, 27. Jahrgang, Stück 3, pp. 39-40. Berlin, 20. Januar 1912.

Germany

The Author conducted experiments on the experimental estate of the Agricultural Academy of Bonn-Poppelsdorf, on the best loamy soil free from weeds, during the years 1910 and 1911, with a variety of Italian rye-grass (*Lolium italicum*) and with the so-called annual rye-grass.

In 1910 sowing took place on the 11th March; on the 10th June the first, and on the 1st and 26th August the second cutting was made, and the fodder made into hay The average yield of hay was 6080 kg. per hectare (48 ½ cwt. per acre). In 1911 Italian and annual rye-grass were sown simultaneously on the 14th March; on the 12th Jnne the first crop and on the 15th July the second crop was cut for hay-making. The annual rye-grass yielded 7700 kg. per ha (61 ½ cwt. per ac) and the Italian rye-grass 4450 kg. per ha. (35 ½ cwt per ac.). The quality of the hay in both cases was of equal excellence.

As the growth of the annual rye-grass is exceedingly rapid and the times of mowing about coincide with those of red clover, it should be valuable for gapping-up clover-leys, especially those that have stood through the winter

504 WACKER, Prof. DR **An Experiment in Growing Summer Vetches for Green Fodder.** (Uber einen Anbauversuch mit einigen Sommerwicken als Grünfutterpflanzen). — *Deutsche Landwirtschaftliche Presse*, XXXIX. Jahrgang, No. 5, pp. 43-44. Berlin, 17. Januar 1912.

Germany

In 1911 a comparative growing experiment was carried out on the experimental field of the Agricultural Academy of Hohenheim with:

1. Green fodder mixture (consisting of Swedish fodder peas, ordinary summer vetches, beans and oats.
2. Danube vetches, and
3. Konigsberg vetches.

The plots were on fairly heavy loam, and were well manured.

The green fodder mixture was sown on the 24th April, and the vetches on the 13th May, under favourable conditions. At the end of July when the crop was mown the following yields were found per acre:

	tons.	cwt.
Green fodder mixture	11	16
Danube vetches	11	0
Königsberg vetches	8	16

The green fodder mixture only produced the heaviest yield because it was sown first. The Danube vetch is nearly free from hairs and, for this reason and owing to its good yield, deserves consideration for cattle feeding.

505

WRIGHT, R. PATRICK. **Report on an Experiment on the Cultivation of Lucerne in Scotland and the Effects of Inoculation (1905-1909).** — *Report of West of Scotland Agric. College*, pp. 159-170. Glasgow, 1911.

This experiment was primarily designed to determine whether the lucerne crop could be successfully grown in Scotland.

Scotland

In many parts of the world lucerne forms the most productive, the most nutritious, and the most highly valued of all crops for the provision, either of green forage, or of hay suitable for consumption by all kinds of farm stock.

It does best in dry and warm climates, and the failure of numerous previous attempts to grow lucerne in Scotland has been put down to the climate being cold and wet.

The writer of this report has, however, grown this plant successfully in his garden, and it also succeeded in a series of small plots laid out in Campbell Park, Glasgow, where the soil consists of clay.

The Experiment Station at Holmes Farm provided an opportunity of trying the growth of lucerne on a larger scale and under fairly suitable conditions.

The field on which the experiment was carried out consisted of a friable loam, well drained and in good condition.

The secret of the previous failures to grow this crop in Scotland was at once revealed. It must not be sown under a covering crop, for it needs abundant light and air, especially in the early stages of growth.

Conclusions to be drawn from the experiment.

1) There is nothing in the climatal conditions of the West of Scotland to prevent the successful cultivation of the lucerne crop on suitable soils.

2) That for successful cultivation, the lucerne must be sown by itself, and not in mixture with other plants or under any covering crop.

3) That it should be sown in rows, so that it may be thoroughly cleaned in the spring of every year. Unless grass and weeds growing up between the rows be regularly removed, they will speedily, in a damp climate, overrun and destroy the crop.

4) That nitrate of soda applied in annual top-dressing is an effective means of supplying the crop with the nitrogen it requires.

5) That the application of a bacterial culture is an equally effective, and a much more economical means of enabling the lucerne plants to obtain the nitrogen they require.

6) That a supply of nitrogen, either in the one form or the other, is essential to the growth of good crops.

7) That supplies of phosphates and of potash are also essential to the production of good crops.

8) That the growth of the lucerne crop is a means of enriching the soil with a large quantity of a highly nitrogenous, and very valuable root residue.

Recommendations.

As the lucerne crop is not at present cultivated in Scotland, the following additional information about it may prove of value to farmers who may think of attempting its growth.

A deep and rather light soil, into which the roots can penetrate freely is the most suitable.

Soils rich in lime are preferable, but in this experiment, the crop in a soil poor in lime gave a yield, on the inoculated plot, on an average of 5 years, of 9 tons 17 ½ cwt. green forage, capable of producing 16 cwt. dried hay, at an average cost in manures during that period of *2 s.* 6 *d.* per acre.

The green forage, which is highly nutritive, is moderately valued at £1 per ton, and the average return on these five years of £9.16 *s.* per acre is much greater than can be got with as little cost from any hay crop at present grown in Scotland.

The forage may be given to all kinds of farm stock, including pigs, and is specially suitable for milch cows.

If properly manured and kept clean, the lucerne will occupy the ground for a considerable number of years, and it enriches the soil in nitrogen to such a degree as will enable it to produce a succession of good grain, or any other crops which depend on a sufficient supply of nitrogen for their successful growth.

Pugliese, A. The Natural Meadows of Southern Italy. A Botanical, Chemical and Agrarian Study. — *Le Stazioni sperimentali agrarie italiane*, Vol. XLIV, F. 5-6, 7, 8-9, 10; pp. 317-413, 517-563, 573-668, 733-766. Modena, 1911. **506**

Italy

The Author reminds us that the question of the production of forage in Southern Italy is of unusual importance in the present state of agriculture of that region, being largely connected with its economic and agrarian conditions.

For this reason he has collected from nearly all the southern regions a large number of forage plants, including 66 samples of natural meadow hay, so as to have a pretty complete idea of the botanical nature of the hays in question and to be able to compare botanical discoveries with conclusions as to their chemical composition and feeding value, drawn from the numerous analyses made in the chemical laboratories of Rome and Modena.

The following are the chief conclusions drawn from the botanical and chemical examination of the hays of Southern Italy:

1. The meadow flora of Southern Italy is seen to be remarkably rich in excellent species of forage, while there is no great abundance of those belonging to other families.

2. The majority of the specimens examined, both singly and as a whole, show the usual botanical characters found in natural meadows, *i. e.* a predominance of Gramineae, followed by Leguminosae, then Compositae, Caryophyllaceae, Labiatae, Umbelliferae, Cruciferae, etc.

3. From a chemical point of view, these hays prove to be rather rich in nutritive substances, particularly protein and minerals; their average composition is similar to that of typical, normal hays, and is equal, or sometimes superior, to that of the most highly favoured regions of Italy.

4. The best hays are generally those containing the largest admixture of leguminous plants and which are cut at the right moment; there is no inconsistency between botanical constitution and chemical analysis, but should a case occur seeming to prove the contrary the reason must be sought for in the influence of special surroundings and methods of culture.

5. The hays of higher altitudes have a much more varied flora, with a frequent predominance of Gramineae; their chemical composition is often inferior to that of the hay of plains and valleys, which does not seem to confirm the prevalent notion that hay grown in elevated regions is all the richer for being exposed to more intense insolation. This defective composition may either be a con-

sequence of the comparatively small importance of radiation, or more probably to the predominance of the Gramineae.

6. As regards the influence of the soil, analysis does not furnish definite conclusions; but it is noticeable that in clay soils or those almost entirely so, leguminous plants predominate and the hay is richer; whilst in calcareous soils, grasses predominate and the hay is poorer.

A few meteorological observations made in the regions under consideration are worthy of notice

a) Frequent and marked changes of temperature, as well as excessive maxima are unfavourable to vegetation and hence to the normal growth of the meadow all the year round.

b) Another condition which hinders the progress of vegetation in the meadows of Southern Italy is the irregular distribution of the rainfall throughout the year.

c) The optimum of atmospheric precipitation, 1000 mm. (39.4 in.) is, with few exceptions (Avellino, Caserta) never reached in any province of Southern Italy.

The Author finally suggests the following remedies for the wretched condition of the Apennine pastures.

I. Technical

1. Improvement of the flora; 2, manuring with the twofold aim of improving the product and lessening the struggle against weeds; 3, precautions against landslips, removal of stoves, construction of terraces; 4, planting woods, regularisation of the course of torrents, drainage of damp soils, irrigation, construction of mountain reservoirs, laying out roads, building shelters, etc.; 5, agrarian propaganda, publications, prize competitions, etc.

II. Economical:

1. Co-operation, 2, Government provisions

With regard to the latter, he quotes the Italian law of 5th April 1908, which aims · *a*) at transforming the ownership of the property of societies and communes, and organising it on a co-operative basis; *b*) improvements in the way of extending the pasturelands, consisting in uprooting bushes, removing stones, draining and filling in marshes; *c*) agrarian improvements consisting in the formation of hay fields, rational use of chemical manures, sowing forage plants; *d*) improvements relating to the management of cattle, consisting in the construction of buildings for housing the herdsmen and for making and preserving the products, of haylofts, stalls, barns, troughs; as well as regulating the means of communication; *e*) improvements in the way of keeping the pastures in proper condition by means of open drains and culverts, planting of woods, pipes for conveying rain and spring water. At the same time the Author laments the insufficiency of the appropriations here given; for it would require £ 216,000 to carry out such a law, aiming as it does at the improvement of all the pastures of Italy; while only £ 8,000 have been voted, to be distributed in 6 financial years.

FIBRE CROPS.

Cotton Growing in Argentina.

Baumwollkultur in Argentinien. Special Report of the Austro-Hungarian Consul at Buenos Ayres. — *Das Handelsmuseum*, Nr. 1, S. 4-5: Wien, 4 Jänner 1912. Cotton Cultivation in Chaco Territory. — *The Board of Trade Journal*, No. 789, p. 95. London, January 11, 1912. **507**

Argentina

The Argentine Government recently submitted to the Chamber of Deputies a bill modifying and increasing import duties on cotton goods. The objec of this is to stimulate and defend the national production. It will be operative for 10 years. The proceeds from the increase of duties will go to form a fund intended for the creation of Cotton Experiment Stations. These Stations will have the task of making trials in the cultivation of varieties of cotton adapted to the soil of the subtropical Northern provinces along the upper part of the Paranà: the provinces of Chaco, Formosa, Corrientes and Missiones.

At Resistencia, on the Metan railway, 96 sq. km. (about 37 sq. miles) of land in the territory of Chaco, have been reserved to form the first cotton-growing colony in Argentina. The land will be subdivided into holdings of 50 to 100 hectares (125 to 250 acres), which will be offered to emigrants who are prepared to stay in the Republic, after the present crop, on the express condition that they are devoted wholly and solely to the cultivation of cotton.

The development of cotton-growing in Argentina is shown by the following figures:

1872	403	hectares.
1888	12	»
1895	879	»
1909	1 738	»
1910	2 140	»

In 1911 the area under cotton was trebled.

In 1909 the fibre crop was as follows:

Country	Tons
Austria-Hungary	43 989
Belgium	12 050
Bulgaria	89
France	13 613
Italy	3 232
Holland	5 999
Roumania	727
Russia in Europe	487 082
Russia in Asia	43 036
Servia	491
Sweden	670
Great Britain	7 179
Total	618 157

Canada and Ireland are the only British countries where flax is grown for fibre on a commercial scale. Experimental cultivations are however being carried out in Cyprus, Africa, the Transvaal and Orange River Colony, and on a larger scale in Behar, India. In Australia, experimental growing has proved the possibility of producing flax in the States of Victoria, New South Wales, Queensland and Tasmania.

Belgian flax is fine, long and of excellent colour; Irish flax is famous for its colour and fineness; Italian flax is the most glossy of all; Russian flax is long, but mediocre in quality; French and Dutch flax are very satisfactory in quality.

509 BRUCK, HINDORF, WARBURG and BUSSE. **Textile Plants in Java and the Philippines.** (Fasererkundung auf Java und den Philippinen). — *Verhandlungen des Vorstandes des Kolonial-Wirtschaftlichen Komitees,* Nr. 2, pp. 13-23. Berlin, 28. Nov. 1911.

Java. Philippines

As a matter of fact it is very difficult to draw the line between « fibres » and « hemp » in Anglo-International Commercial nomenclature; all the more that the most important fibrous plant is called « Manila Hemp ».

The total production of fibres in the whole world is 350 000 tons, represented by 170 000 tons of Manila hemp and 100 000 of Mexican sisal; the rest is divided between various species of *Agave* of Central America, the West Indies and the African Colonies.

Mauritius hemp produced by *Fourcroya*, New Zealand flax, Indian hemp, pineapple, ramie, cocoanut etc are also noteworthy.

To these must be added the real hemps, of which Russia produces 150 000 tons and Italy 80 000. Jute is excluded from this study, the materials made from it being of secondary value.

Manila hemp is cultivated in plantations at Java in conjunction with *Hevea*, which however suffers in consequence, and yields less rubber. Machines are being introduced for the preparation of Manila hemp, and it seems that the natives are increasingly interested in cultivating it.

Manila hemp plantations are also on the increase in the Philippines, especially in Mindanao.

The harvest and preparation of hemp are carried on in the most primitive manner in these islands. In Mindanao however, machines have been introduced. Manila hemp represents little less than half the total export trade of the Philippines. But as exportation increases, the quality diminishes in value.

Good results have also been obtained in both Java and the Philippines by the cultivation of pine-apple and *Hibiscus cannabinus*. Experiments at Manila made with hemp in the manufacture of rope have been successful and point to the advantage of building a rope-factory.

The *Agave Sisalana* in the island of Java continues to produce abundantly up to the age of 8 or 9 years and sometimes even two or three years longer Under favourable circumstances the crop of dry fibre is 2 ½ tons per bouw (1 *bouw* = 1 ¾ acre). Manila hemp grown in Java gives 2 tons per bouw.

German colonial products, in order to hold their own in competition with the Philippines, must include sisal of the highest quality.

Java is the only tropical country besides the Philippines where it has been possible to cultivate Manila hemp successfully.

It has been a failure in every other country

The problem is to find out whether it is worth while to adopt machines with all the latest improvements, but of great price, to be used in the preparation of the fibre.

RUBBER, GUM AND RESIN PLANTS.

510 **Rubber in the Dutch Colonies, the Malay States and the Gold Coast.** The Netherlands and the late Rubber Exhibition. — *The India Rubber World*, Vol 45, No 4, p, 163, New York, Jan. 1, 1912. — Kautschukproduktion der Malayenstaaten. Uber Gummianbau in der Goldküstenkolonie — *Gummi Zeitung*, Nr. 16, S. 604; S. 604-605. Berlin, 19 Januar 1912.

Dutch Colonies

Holland, whose colonial products were very well represented at the Rubber Exhibition in London, has 217 Rubber growing Companies in its Indian Colonies, *viz.* 102 in Java, 95 in Sumatra, 12 in Borneo and 8 in Riouw

Of these Companies forty-five sent specimens of rubber to the Exhibition in London

The production of balata in Surinam which 1893 amounted to 32 524 kg. (32 tons), increased to 890 816 kg. (876 ½ tons) in 1910. Grants of land for the cultivation of balata rose from 172 400 acres in 1893 to 2 201 350 acres in 1910.

Malay States

At Singapore no great feeling of optimism prevails with regard to the production of rubber during the next few years.

And less and less confidence is placed in the assurances of Government that in 1916 the Malay States will be capable of producing 70 000 tons of rubber This is owing to the waut of capital, which has obliged the Societies to give up planting extensively as was first intended. It is impossible to count on producing more than 40 000 tons by 1916. So far 400 000 acres have been and 700 000 acres still remain to be planted with rubber. £ 59 per planted acre have been invested.

Considering that many of the plantations now in existence will have to be replanted, it may be calculated with certainty that 350 000 acres will be ready to bear by 1916, and taking the average yield to be 250 lbs. per acre, the total returns for 1916 may be estimated at about 40 000 tons. The returns for 1911 are most unlikely to amount to 12 000 tons as expected, judging by the quantity now being accumulated in the ports of Singapore, Penang and Swettenham.

Gold Coast

Great strides have been made in rubber-growing on the Gold Coast. *Hevea Brasiliensis* was first planted in the Botanic Gardens at Aburi, after which government plantations began to be made at Torkuva, Coomassie and Assuantsi.

India rubber is now cultivated by the Europeans and seeds are distributed to the natives.

The culture of *Funtumia elastica* is also widely diffused, while *Castelloa elastica, Manihot Glaziovii* and *Ficus elastica* are still in the experimental stage.

Hevea Brasiliensis, although cultivated in poor soil, is very productive at Aburi, which is about 500 meters (1700 feet) above the sea.

After a trial incision in 44 plants divided into three groups, the result given in the following table were arrived at:

Group —	Number of plants —	Method of incision —	Number of incisions —	Dry Rubber collected gms	Average per Tree Yield gms.	Average per Tree and incision gms.
I.	15	V-shaped cut.	14	1060	71	4,8
II.	15	Large V-shaped incision and re-opening of scars.	20	1972	131	8,8
III.	14	Half spiral.	20	1979	141	9,9

At Tarkwa the results are better, equalling the production of Ceylon and the Malay States. After four and a half years' growth the young plants have a medium circumference of 43 cm. (17 in.).

Incisions made in 5 year-old trees produced 1135 gms. from one, and 1191 gms. from another group of 15 trees.

The experimental plantations at Coomassie are also in a promising condition and the same may be said of those at Assuantsi.

Analyses made of two kinds of Para Rubber from the Gold Coast, have determined its superior quality, as may be deduced from the following table:

	I		II	
Moisture	0,39	%	0,57	%
Rubber.	95.53	»	95.96	»
Resin	3,90	»	3.25	»
Ash	0,18	»	0,22	»

Plantations of *Funtumia* (*Kickxia*) *elastica* exist at Aburi; Tarkwa and Coomassie. The climate of Aburi is not altogether adapted for the cultivation of the *Funtumia* variety. In fact, in a row of 120 trees which had been planted 6 years, their maximum circumference never exceeded 27 cm. (10 $^{2}/_{3}$ in.). At Aburi there are

12 800 *Funtunia* trees. The following are the results of experiments made on 5 groups of these trees with a view to testing their productive capacity:

Group	I	II	III	IV	V
Number of Trees. . .	15	15	15	15	15
Average circumference at 3ft 3 in. above the soil	18.5 in	18 9 in.	18 3 in.	?	18.5 in.
Method of incision . .	(1) Herring boned. Seven incisions every ten days	Parallel vertical incisions	Half herring boned. Seven incisions every ten days	(1) Herring-boned Seven incisions every ten days	Herring-boned. One incision
	gm.	gm	gm	gm.	gm.
Total amount of Rubber collected	343	407	260	580	570
Average Amount per Tree	22 9	27 1	17 32	38.6	38
Average amount per Tree and Incision .	3 26	3.85	2.47	5.50	38

Method V, adopted by the natives gives almost the best results.

The *Funtumia* is cultivated by Europeans on a large scale and the natives too are taking it up with great interest.

VARIOUS CROPS

511 CHARLAN, F., CHEVALIER, O., and BARNET, W. A. **Tobacco-growing in British Columbia and Canada.**—(Service des Tabacs. Rapport pour l'année 1910).—*Ministère Fédéral de l'Agriculture: Bulletin sur le tabac*, N. A—12, pp. 69. Ottawa, Avril 1911.

A recent bill has granted protection to Candian tobacco-leaf by levying a tax on foreign tobacco sufficient to guard the national product against competitors in the United States. The centres of **Canada** production are: Quebec, where the Canelle, Connecticut Seed Leaf, Havana Seed Leaf and Comstock Spanish are cultivated; and South Ontario (Counties of Essex and Kent) where the Burley variety is specially grown. During recent years the tobacco harvest in South Ontario amounted to from 5 to 6 million pounds. In the latter district the climate is very mild and slow-growing varieties may be cultivated there. It is not rare to have a crop of about a ton to the acre. In British Columbia the climate is extremely mild and the soil is ferruginous. The varieties cultivated are Cuban, Havana Seed Leaf, Comstock Spanish and others.

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(1) In the second case the distance between the sides of the herring-bone is less than in the former.

At present Canada produces about 10 million pounds of tobacco annually. Three fifths of this are grown in Ontario and two fifths in Quebec. Chewing tobacco is specially produced from Burleys in Ontario. The black sorts for pipe-smoking are from the Grand Seed Leafs of Quebec and the best leaves of the Seed Leaf and Comstock. The new protection bill will have the effect of increasing the production of Canadian tobacco by a third, but it cannot be said that the trade is promising in the way of exportation, at least not for the near future. The present native production is only sufficient for a third of the consumption; the importation of the United States comprises chiefly cigars. Independently of the law by which the Canadian Government protects native production, there is a special department whose business it is to advise and assist planters in improving the quality of their products.

The centre of tobacco-planting in British Columbia is the valley of Okanagan, especially Kelowna. The year 1910 marks a great revival in tobacco planting in British Columbia. Two varieties are specially grown there: Cuban for the inside and Comstock Spanish for the outside of cigars. The maximum crop of 1909 was 50 000 lbs. This amount ought to be multiplied tenfold.

At the experimental farm at Ottawa, Comstock Spanish and Canelle were tested with a view to the production of seed; as well as those of Vérel and Montmélian imported from France for the production of pipe tobacco. In the province of Quebec there are two experimental stations. Saint-Jacques and Saint-Césaire. At the first of these experiments are made in crossing the following varieties:

Comstock × Sumatra
Comstock × Sumatra × Sumatra
Big Ohio × Sumatra.

In connection with these hybrids, experiments were made in seed-production, the preparation of beds, measures for exterminating fungi and noxious insects in nurseries and hot-houses, and with oxalate of nicotine and Paris green as means of destroying the grey worm (*Agrotis segetum*) and wireworm (*Elater segetis*).

As regards the latter, the following results are noteworthy:

1. The action of oxalate of nicotine is beneficial especially if concentrated to $^1/_{125}$ and its effect is greater than that of Paris green.

2. Paris green in solution has no more effect than if applied as a top-dressing; in fact it does not kill either grey worms or wireworms when used in solution

3. Oxalate does not kill but drives away these insects.

At the above-mentioned station, interesting experiments in manuring were made on five plots, with the Comstock Sumatra hybrid. The Big Ohio × Sumatra hybrid gave the best unit yield in the province of Quebec. At the Saint-Césaire station comparative studies are to be continued with the two hybrids Brewer Hybrid and Comstock × Sumatra. At the Harrow (South Essex, Ontario) testing station, experiments were made on 12 acres of Burley, Big Ohio, Connecticut Broad Leaf; and Virginia tobacco, dried by hot air (Warne variety). It is advisable not to replant Burley on the same soil under an interval of three years. In places where Burley is not a success, particularly as to colour, Broad Leaf and Big Ohio may by cultivated with advantage.

512 ROTHE, FERNANDO. **Coffee Cultivation in Costa Rica.** (Café-Kultur in Costa Rica). — *Revista Economica*, Num. 5, pp. 484-486. San José, Costa Rica, 1911.

Costa Rica

At the present time it is estimated that there are 35 000 ha. (87 000 ac.) under coffee in Costa Rica.

The export of coffee for the last few years has been as follows:

	kg	tons.
1906	13 774 258	13 556
1907	17 325 531	17 051
1908	8 997 531	8 855
1909	12 030 104	11 840
1910	14 396 925	14 169

The amount of coffee consumed in the country is very large; it may be estimated at 10 % of that exported. One hectare yields on an average 423 kg. of coffee (per acre, 378 lbs.). Of the 35 000 ha., about 5 000 are cultivated intensively.

The cost of the coffee plantations on virgin soil is about 800 marks per ha. (£16 per acre). The expense can be reduced by a half if potatoes, beans or vegetables are grown between the trees. Cultural expenses are 100 to 160 marks per ha, (£2 to £3.4s per acre).

Firewood from the shelter trees fetches 8 to 14 marks per cub. m. (3*d* to 5*d* per cub. ft.).

The produce of small plantations is sold to the large proprietors who prepare it for export. The best coffee goes to England.

Trees from 5-10 years of age yield the heaviest crops. When the trees are above the latter age, the plantations must be replanted or recourse had to intensive cultivation.

In the interior there is an area of about 10 000 ha. (25 000 ac.), which is easily accessible and suitable for new plantations. In the Cordillera, about 25 or 30 km. (30 to 50 miles) from the railway, there are also 70 000 ha. (175 000 ac.) suitable for cultivation, *i.e.* about double the area at present under coffee.

FRUIT-GROWING.

KOBER, FRANZ. **The Oppenheim Method of tying up Vine Shoots.** (Die Oppenheimer Heftvorrichtung). *Allgemeine Weinzeitung*, 25. Jahrgang, No. 16, pp. 159-161; 26. Jahrgang, No. 16, pp. 163-164; 27. Jahrgang, No. 4, pp. 34-35. Wien, 21. April 1910, 20. April 1911 und 25. Januar 1912. **518**

Austria

The Viticultural School at Oppenheim, Hessen, has for some years made use of a labour-saving method for tying the young vine canes, which has been put to the test by the Author in Austrian public and private vineyards, and has been found thoroughly effective.

A brief description with drawings will make the construction of the trellis in question and the method of working clear. At both ends of each row of vines a wooden or better still an iron post (iron tube) is fitted upright in the ground. Between the two terminal posts, at distances of about 6 metres (19 ft. 6 in.), other wooden posts, about 10 cm. (4 in.) in diameter, are placed. The whole of the posts must project from 1.3-1.8 metres (4 to 7 ft.)

above the ground, according to the height to which the particular variety of Vine grows. The terminal posts are provided on two sides with 3 pairs of iron hooks; the first pair (A) is 30-40-50 cm. (12-16-20 in.) above the ground; the second pair (B) is about 30 cm. (12 in.) and the third (C) about 0.80-1 m. (31 to 39 in.) above the first. The intermediate posts are also equipped at corresponding heights with hooks or with 2 nails on both sides, but this is not absolutely essential. From the hooks on the end posts galvanised iron wires are stretched; the hooks or nails on the intermediate posts form points of support for these wires. The wires themselves should have a diameter of 2.5 mm. (about $^1/_{10}$ of an inch); they must be as long as the particular rows of vines. At their ends they carry small chains, which are suspended in the hooks on the posts and allow of tightening the wires to a lesser or greater extent. If the rows are more than 100 m. (109 yards) long, it is difficult to tighten the wires when only 2 terminal posts are used; for this reason very long vine rows are split up into 2 or more divisions, so that there are two terminal posts for a length of 50-100 m. (54 to 109 yards).

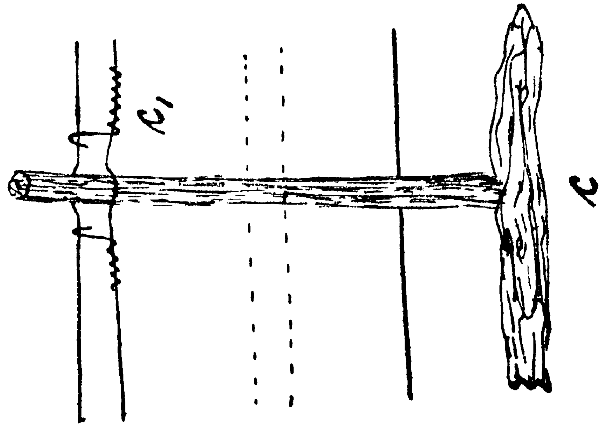
When the young vine shoots have got to a length of 15-20 cm. (6 to 8 in.), they are tied up for the first time; 2 wires are hung on to the bottom hooks of the terminal posts so that the young vine shoots are between two parallel wires (see Figures I and II).

Tying up on this method can be carried out by one man alone, but it is best done by three workmen together; two stand at the ends of the row and hang the wires in the hooks while the third one sees that when the wires are drawn up all the vine shoots are caught. After some time, when the young shoots have grown longer, a second pair of training wires are put in, but in the next higher hooks. For a third tying it will in most cases suffice to shift the wires from the middle hooks (B) into the top ones (C) (Fig. II).

To keep the wires together small wire hooks are fastened to them (Fig. I c.). In the first stage of the vine growth the hooks should not be joined up, or at any rate not all of them; the wires then move further apart and allow more space between them for the growth of the shoots. If one wire hook is closed up right and left of the intermediate posts, nails or hooks on the latter to carry the wire are not needed, and this gives the further advantage that the wires can be fastened to the posts at any height, provided that there are more than three pairs of hooks on the terminal posts.

In the winter the bottom wires are taken off and hung in the upper hooks. It is still better to place higher intermediate posts at distances of 15-20 m. (16 to 22 yards), provide them with hooks above and put the wires on the latter until they are once more used in the spring. The wires then form no obstacle to pruning and tillage.

As our illustrations show, the method can be applied to different modes of training; *a* in both figures shows the stocks in the autumn, and *b* in the spring, after pruning, *c* represents intermediate posts. The saving of labour by the use of the new method is considerable; one workman at Oppenheim fastens up about 1 hectare (2.47 acres) per day on this method. In the Austrian experiments the cost of tying up was roughly 50-55 francs per hectare (16s to 16s *6d* per acre), while tying with straw or bast involved an expenditure of five times this amount for the same area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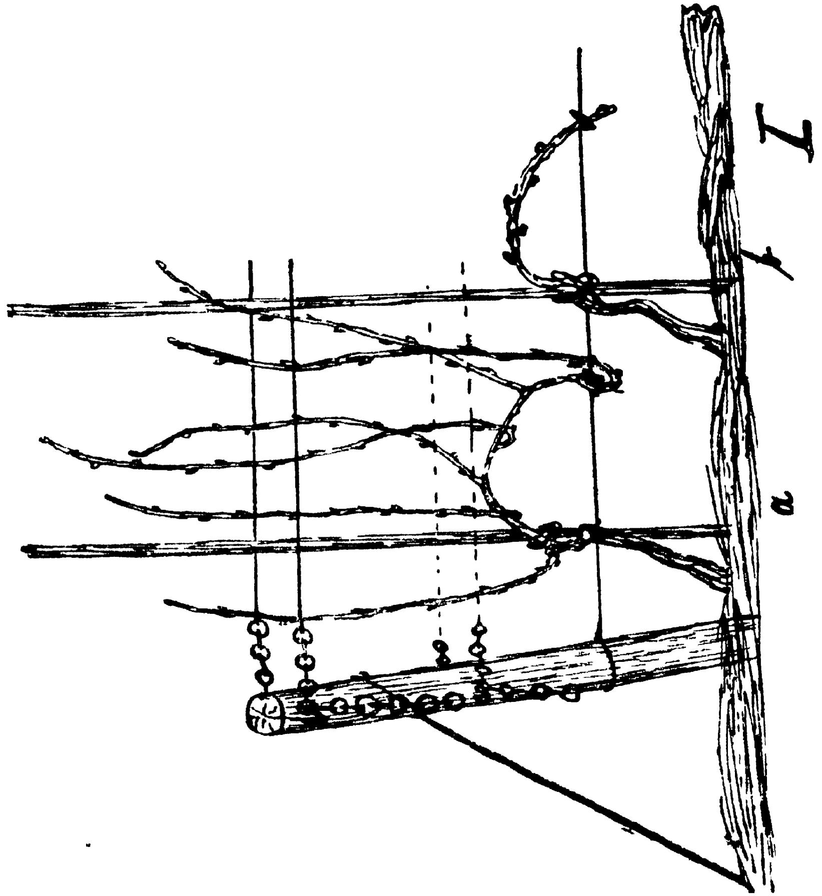
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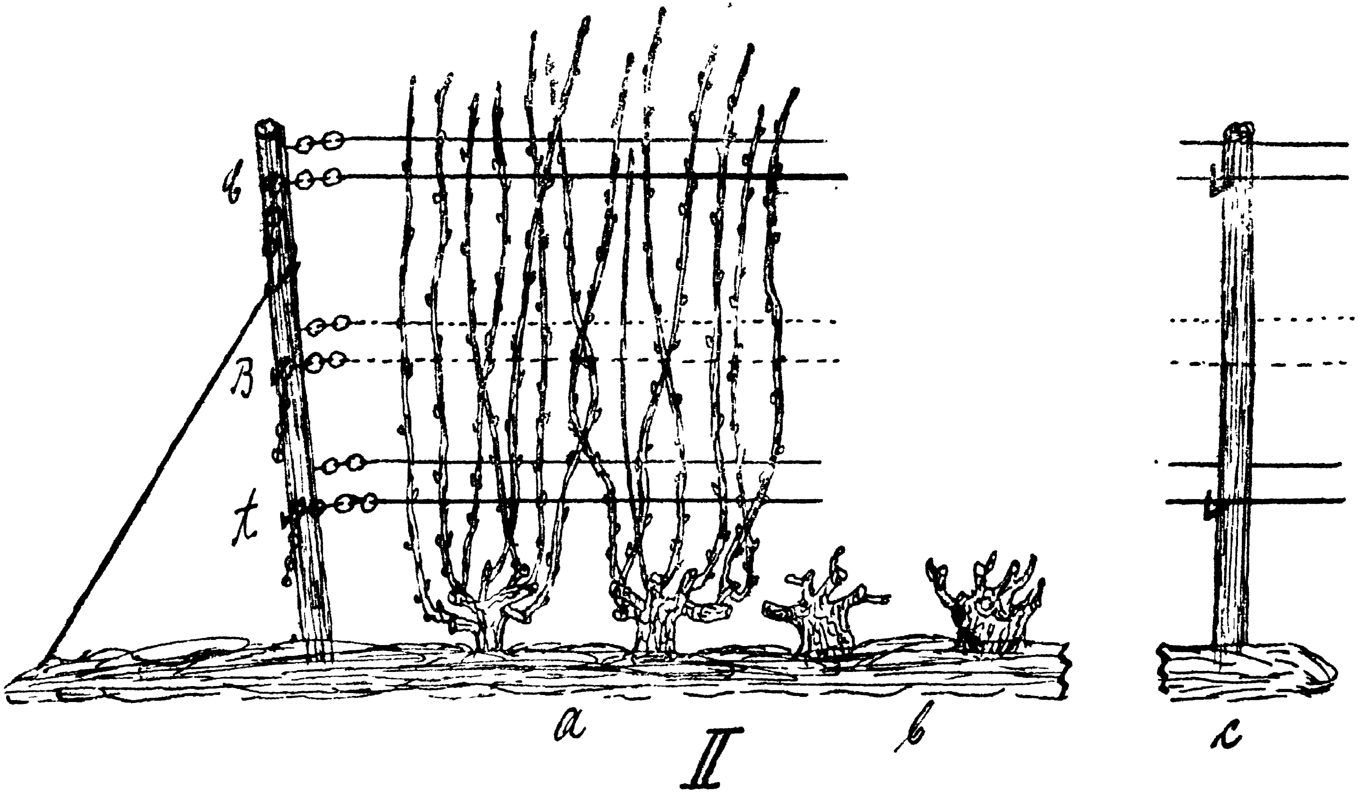
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514 RAVAZ, L. **Leaf-stripping of Vines.** (L'Effeuillage de la Vigne). — *Annales de l'Ecole Nationale d'agriculture de Montpellier.* Tome XI, Fasc. III, pp. 216-245. Montpellier, Janvier 1912.

France

The utility of stripping off the leaves of the vine has been called in question. It is argued that once we find that it is not a regular annual practice in a given vineyard, the explanation is that its utility is non-existent or even negative. If it be borne in mind, however, that owners do not make up their mind to undertake expensive tending operations unless they have found them to be effective, we must guard ourselves against condemning this practice *a priori*. Though it may not always be justified by experiment, the reason no doubt is that the experiments do not cover sufficient ground.

An experimental study of this question is for that matter no easy task. The removal of the leaves has the following consequences:

1. A better light supply to the grapes.
2. The elimination of shaded leaves, which may be hemi-parasites.
3. The reduction of the leaf surface of the plant, which in turn entails a reduction: (*a*) in transpiration; (*b*) in respiration; (*c*) in assimilation.
4. And finally, as the leaves removed may be varied both in number and age, according to the time or successive times at which the operation is carried out, it will be readily understood that its consequences are in turn very variable.

In order to be able to forecast the definite result, it is needful to investigate the bearing of each of these modifications on the conditions of vegetation.

Influence of better light supply on the ripening of the grapes.

Altough this is a very vexed question, it does seem that light exercises a greater influence than heat.

The Author shut up some clusters of Aramon and Pinot. grapes in dark boxes some time after flowering. The boxes were white-washed outside or surrounded with a thick layer of moss so as to prevent a rise in temperature inside the box. A long blackened tube provided for air renewal, and a thermoneter enabled the variations of inside temperature to be followed, The results were as follows:

Character of experiments	Weight of Bunches	Number of grapes	Weight of 1 grape	Acidity	Specific Gravity
	gm.		gm.	%	
Pinot enclosed in boxes	116	102	1.14	4.0	1.0807
Control Pinot	348	300	1.16	4.0	1.1097
Aramon enclosed in boxes:					
No. 1	112	73	1.53	6.3	1.0323
No. 2	138	98	1.40	6.1	1.0363
No. 3	46	29	1.58	3.9	1.0503
No. 4	29	17	1.64	5.6	1.0328
Control Aramon	37	75	3.16	4.8	1.0528

In the dark the grapes ripen and colour, and the Pinot seems to require less light than the Aramon. It is likewise an earlier variety. The want of light does not prevent the ripening and colouring of the grapes, but retards it, and the retardation is more marked in proportion as the varieties of vines are later maturing or cultivated in more northerly regions.

For that matter, facts of ordinary observation likewise prove the results of these experiments to be well grounded. The grapes begin to ripen and colour on the side exposed to the sun; those inside the bunches likewise ripen, but later than those outside.

Influence of air temperature on the flowering of the vine.

It is exceedingly important that the temperature should be high at the time of flowering. In low temperature, flowering in the open vineyard is indefinitely prolonged and ends badly: those are the years when the fruits drop and wither. In high temperatures on the contrary it is very rapid ; these are the good fruiting years; of course always referring to a temperate climate.

Influence of the temperature of the air on the ripening of the grape.

A Picquepoul vine was grown under glass until after flowering. When the grapes were well formed it was carried outside and placed against the glass ; one bunch, the highest on a branch carrying two, was placed inside the hothouse, the other remained outside, together with all the other bunches of the vine and all its leaves. The inside bunch was consequently under the same conditions of feeding and light as the outside bunches ; it was only in a hotter atmosphere, as is shown by the records of the registering thermometers.

Results The outside bunches continued to grow, but very slowly. The inside one put on size more rapidly, coloured early and ripened. The difference in the size of the grapes and sugar contents is indicated in the following table :

	Total wight gm	No of grapes	Weight of grapes gm	Weight of 1 grape gm	Sugar per 1000	Acidity: as H_2SO_4 per 1000
Inside Bunch . . .	43 0	42	40 0	0.952	117.5	7.025
Outside Bunch . .	17.2	54	13 8	0 205	18.24	20.652

Thus, even when the outside conditions are highly unfavourable to the function of the leaves, the grapes can ripen if they enjoy a sufficiently high temperature. It will be seen how great is the direct influence of the temperature on the ripening of the grapes.

Influence of the removal of shaded leaves.

The removal of shaded leaves is evidently of advantage in northern regions ; they must frequently expend more than they produce; whilst it may even be injurious in countries enjoying much sunlight.

Reduction of transpiration The reduction of transpiration is rather injurious in wet countries and useful in dry countries.

Reduction of assimilation The leaves removed are always the oldest and, according to Macagno and Cuboni, the leaves at the base of the vine shoots assimilate less than leaves recently full grown. This is also the opinion of Audoynaud, and these three Authors concur in saying that on the whole the removal of the leaves at the base of the shoots can only be harmless or useful in our regions.

M. Müntz is opposed to the practice of leaf-stripping.

Confronted with these divergencies of opinion, the Author took up the study of the question again and arrived at the following conclusions .

Leaf-stripping is sometimes injurious, sometimes indifferent, sometimes useful.

1. A continuous stripping of the leaves by which the vine is constantly deprived of its leaves in proportion as its shoots grow, results in the death of the stock before the grapes have ripened.

2. Complete leaf-stripping carried out when growth has stopped is manifested by retardation of ripening and reduction of the sugar contents.

3. If ordinary leaf-stripping is adhered to, consisting in the removal of 5 to 10 leaves from the base of the branches (the latter may have more than thirty, besides those of the side shoots), it is seen to have been injurious to the following:

To a vigorous Folle blanche trained on iron wire.

To robust Grenaches, trained on iron wire.

To Aramons, vigorous and spreading their shoots freely on the ground.

It left the bent Pinots almost entirely unaffected.

It was very useful: 1) for feeble erect Pinots; 2) for feeble erect Grenaches; 3) for the Gamay, likewise feeble and erect.

Keeping to these features, the efficacy of leaf-stripping would seem to be bound up with the direction of the branches and the duration of growth. Weak vines which early cease growing, vines of erect habit, either in consequence of their feebleness or owing to their nature, or owing to the stake, are therefore those likely to benefit most.

Vigorous vines of prolonged growth or with bent shoots trained on iron wire derive less benefit or even suffer.

This diversity in the results of the operation will perhaps be explained if it be remembered:

1, that the elimination of the leaves, even the leaves at the base, reduces the assimilation surface: " injurious effect "; 2, that the exposure of the grape bunches to the sun promotes their ripening: " useful effect ".

But in order that the latter should outweigh the former, the other centres of attraction, such as the growing tips and the side shoots, must not change the direction of travel of the cell contents; neither must blockings, such as annular incisions, bends, etc, slow down the rate of movement towards the grapes. Vigorous vines however remain in growth for a long time, and vines trained on iron wire or without stakes have more or less bent branches.

Under ordinary conditions, stripping is rather beneficial than injurious to the quality of the products. It is therefore a practice highly to be recommended for obtaining high quality wines.

POPENOE, F. W. **The Mango in Southern California.** — *Pomona Journal of Economic Botany*, Vol. I. No. 4, pp. 153-200. Claremont, December 1911. **515**

United States: California

The cultivation of the mango, which is so remunerative a fruit, is still little known in California. The few trees hitherto introduced have yielded poor results owing, doubtless, to the small amount of care devoted to them. The mango behaves differently according to the locality in which it is grown. It is more suited to the hot interior valleys, where it is sheltered from winds and frosts, than to the sea-coast, owing to the lack of sufficient heat near the ocean during the summer months for the proper ripening of the fruit.

It seems reasonable to believe that the valleys of San Joaquin, Imperial and Coachella will produce first class mangos.

But the varieties which have been grown here, so far, have no special value, and offer no point of departure for selection, which in any case, is a process requiring so much time, that it is best to graft upon them the best Indian varieties. The most successful method is inarching.

The necessary work connected with selection, acclimatization, and cultural experiments has been started by the Department of Agriculture; a series of inarched trees, comprising about forty of the choicest varieties from India and other countries, have been sent to several locations in S. California for trial.

The list includes, Alphonse, Ameeri, Amini, Bhadauria, Bhurdas, Bombay yellow, Brindabani, Bulbulchasm, Cambodiana, Caraboa, Chickna, Davey's Favourite, Divine, Ennuria, Faizan, Fernandez, Itamaraca, Jamshedi, Julie, Kachmahua, Kistapal, Langra, Langra Hardoi, Langra Large, Malda, Maller, Mulgoba, Mullgoa, Paheri, Punia, Rajabury, Salamar, Sharbati Black, Singapur, Stalkart, Sufaida, Surkha, Totapari and White Alphonse.

The results of many experiments by Prof. Rolf seem to indicate beyond the possibility of a doubt, that the question of stock is of the utmost importance, as in the case of the mango the stock behaves differently according to the scion chosen.

Thus it is important to determine not only those Indian varieties which are most adopted to the climate and soil of California, but also to find out those local acclimatized varieties which will serve as the best stocks for them.

The writer gives a detailed botanico-agronomical description of the different indigenous varieties: Sierra Madre, Fales, Santa Ana, Red Number Eleven; and concludes with a long list of the most common varieties of mangos.

516 **Cocoa-Growing on the Gold Coast.** (Die Kakaokultur an der Goldküste). — *Der Tropenpflanzer*, No. 1, pp. 39-44. Berlin, Januar 1912.

Gold Coast

The Gold Coast presents an almost unique example in Colonial development. During a period of 10 years this country has developed the cultivation of cocoa to such good effect that it speedily reached and has perhaps surpassed that of Sân Tomé. The Gold Coast, in 1910, exported 460 000 sacks of cocoa representing 23 000 tons, while even the Cameroons, from 1898 to the end of 1910, only exported 85 000 sacks, representing 4 000 tons. On the Gold Coast, cocoa-growing is a strictly native cultivation. The largest plantations do not exceed 30 acres; each acre has about 600 plants. The districts where cocoa grows are about 28 to 30 miles from the coast. The construction of the railway traversing the plantation region has been extremely influential in the sense of developing this crop.

Plantations yield fruit when 6 to 12 years old. The natives procure a crop of about 6 ½ lb. of dry cocoa per tree, while in the experimental Garden of Aburi from 8 ½ to 11 lb. have been obtained. The Government has entrusted three Europeans and eleven natives with the supervision of the cultivation and instruction of the natives.

The production will continue to increase, because a number of plantations are not yet old enough to produce. Cocoa growing has been a veritable source of wealth to the Colony, the more so as it provides occupation for at least 10 per cent of the entire population.

FORESTRY.

The Preparation of Forest Maps and their Practical Importance. 517

1. GLASER, THEODOR. Die Herstellung forstlicher Bestands-übersichts- und Wirtschaftskarten — *Forstwissenschaftliches Central Blatt*, LVI. J., H 1., pp. 10-27 Berlin, Januar 1912.

2. WALTHER, F Zur Frage der Vervielfältigung forstlicher Bestandeskarten. *Ibidem*, LV. J, H. 6., pp. 334-341. Berlin, Juni 1911.

3. Anleitung zur Standorts- und Bestandesbeschreibung beim forstlichen Versuchswesen. (*Nach dem Beschlusse des Vereines deutscher forstlicher Versuchsanstalten vom 3. September 1908*). Zw. Aufl., pp. 33. Neudamm, 1911.

4. LOVAT AND STIRLING OF KEIR, LORD. Affoiestation in Scotland, Forest Survey of Glen Mor, and a Consideration of Certain Problems arising therefrom, 1911 — *Transactions of the Royal Scottish Arboricultural Society*, Vol. XXV, pp. 91 + pl. 1 + Maps 3. Edinburgh, 1911.

Amongst the instructions referring to forest-management, which have lately been published by the Afforestation Departments of the **Germany**

German States, besides those of Saxony (1), which are very detailed, the publications of the Bavarian Government (2) may be regarded as models.

It is sufficient for our purposes to set forth the different aims of forestry, which are as follows:

1. To give a comprehensive representation of all the present economic conditions which have to do with forest exploitation.
2. To determine on this basis, with due regard to the economic ends served by the forest, the best economic rules to follow.
3. To draw up plans for the immediate regulation of the forest exploitation in question.
4. To ensure that the above shall be carried out, and to provide for future development.

The first of the aims mentioned is attained by means of descriptive forest maps, which also show the methods of management; for the preparation of these, the data collected under 1 and 2 will be useful.

These maps, in order to possess real practical value, must in the first place meet the following requirements:

a) Give, as accurately as possible, the topographical conditions.

b) Supply as accurate a representation as possible of the forest and economic conditions, and for this reason, the maps must not be on too small a scale.

c) Combine the information into a clear and comprehensive whole.

d) The execution of the maps should be relatively simple, in order that they can be reproduced quickly and cheaply. They should also be as resistant as possible to light and weather.

With reference to point *a*), the hydrographic conditions should be shown in blue, the courses of the rivers, which are important from the forestry point of view, can also be indicated by the same colour.

Contours are also of very great importance from the standpoint of afforestation and exploitation and should never be omitted;

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(1) Geschäftsordnung für die Kgl. sächsische Staatsforstverwaltung, einschl. d. Forsteinrichtungsanstalt & Forstakademie, 2. Bd. Forsteinrichtung u. Betrieb, pp. 165. Dresden, 1911.

(2) Anweisung für die Forsteinrichtung in den K. B. Staatswaldungen. — *Mitteilungen aus der Staatsforstverwaltung Bayerns*, H. 11, pp. 142 + C. e form. 33. München, 1910.

they should be marked every 10 metres (32 ft. 10 in.). The conditions of viability have also a special interest; these cannot be indicated by maps on the scale of 1 to 20 000. Further, for technical purposes, the different types of transport must be shown, and for administrative reasons, the public and private roads must be indicated.

With regard to point *b*), it is advisable to employ a scale of 1 to 10 000 or 1 to 12 500.

Under heading *c*) the chief importance is given to the species of trees and their classification according to age.

For this purpose, numerous methods exist and they may be divided into three groups.

I. Species of trees indicated by colour, classes by shades; advantages, clear and looks well Disadvantages, application limited, difficulty of reproduction.

II. Species of trees in colour, classes in hatching; advantages, rapidity of execution, clear definition of classes, facility of reproduction. Disadvantages, want of clearness, and unaesthetic appearance.

III. Trees represented by abbreviations and symbolic signs, classes in colour; advantages, facility of preparation. Disadvantages, slight difficulty in reproduction, want of clearness.

The writer of article 1, basing his remarks on the researches of Sinner (1) recommends the following system of reproduction:

1) The species of forest trees should, as far as possible, be represented by the same colours throughout, and graphic signs, and the initials of their common names should be employed in the case of secondary trees in mixed woods.

2) Ground not covered by forest should be left uncoloured; the usual topographical signs can be used for other formations, fields, meadows, etc.

3) Classification according to age will be confined to the principal divisions, three for example, represented in light and shade, and the sub-classes by alphabetical letters, adopting Roman numerals for the classification of the ground, and placing them above or below the line according as it is wished to indicate the first or second half of these sub-classes. The ground classes of I to V are subdivided under the Arab numerals 1-4. The stand classes are

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(1) *Mitteilungen des Vereins bayerischer Staatsforstverwaltungsbeamter*, V. J., 3-4 H. 1909.

taken as tenths of the maximum of the whole, and are indicated by the Arab numerals 1 to 9 which must be pointed off.

Example : $a^{\mathrm{II}\ 3.7}$, $b_{\mathrm{I}\ 2.9.}$

4) The series of the sections can be indicated by arrows.

5) Secondary felling, clearing, etc. is shown by red lines.

6) Exploitation felling should only be indicated when so doing does not impair the clearness of the map.

7) Kind of wood. —

High-forest.

Natural regeneration:

a) selection plan, white dots in the regeneration areas;
b) successive felling, small white circles;
c) strip felling, white lines with small commas between them;
d) combination, all the preceding signs used together.

Artificial Regeneration — clear felling, hatching in white lines.

Coppice, with a special colour and with light and shade.

Coppice-with-standards. Coppice and standards each indicated by the above signs.

With regard to *d*) the reproduction of the maps, it is necessary to remember, that the original maps or lithographs should contain all the essentials given under head *a*). The indications coming under *c*) can be added by hand from time to time, as required.

The process of reproduction, in short, should be inexpensive, and not injure the outline and the paper. The colours should be good and lasting. It is well to use fixatives and also celluloid covers.

For further information on the subject with a view to experiments in forestry, besides the works quoted by the writer of article I, especially from the standpoint of map-making, reference can be made to the guide to the description of the forest stations and plantations published by the Union of German Stations of Experimental Forestry quoted above as No. 3, and to which a model form is added.

As regards reafforestation, the survey made for the Royal Scottish Arboricultural Society quoted as No. 4. at the head of this paper, is of great practical interest at the present time. This work was undertaken to serve as the model of a general survey of Great Britain, with the aim of determining the amount of existing forest, and especially the areas which would repay reafforestation. It may be useful to note the methods followed in the work.

1) Detailed survey of the ground with reference to its suitability for sylviculture.

2) Complete analysis of existing economic factors and of the modification in these which reafforestation will entail.

3) Extension of area of afforestation, with due regard to the two previous points.

4) Plan of the areas to be acquired by the Forestry Department, to be rented by the Department, to be replanted in cooperation with the owners of the property, to be planted by the owners with the assistance of an advance from the Government, to be replanted by the owner at his own expense and subject to inspection.

5) Necessary preliminaries to afforestation: central place for nursery, sawyard, etc.; dwellings for workmen; compensation for sheep pastures, woods and ground used for shooting; indemnities; acquisition and care of existing woods; future utilization of timber.

The survey is limited to a zone containing, besides some woods, an area of 60 000 acres suitable for reafforestation. Three forestry maps are given, one contains general topographical data, and shows existing forests, the second shows the areas suitable for replanting, the trees being indicated by different colours (red: larch; blue: spruce, common and Sitka; green· Scotch pine). The third, like the second, gives the subdivisions in three shades showing the ages of the plantation, from 1 to 15 years, 15 to 30 years, 30 to 40 years.

Some Recent Results of Forest Economy in England. 518

SLATER, ALEXANDER. Growing Larch for Profit. — *Quarterly Journal of Forestry*. Vol. VI, No. 1, pp. 1-11 + figg. 2. London, Jan. 1912.

ACKERS, C. P. A Successful Example of Open Planting. — *Ibidem*, pp. 20-22.

PRATT, E. R. Estate Economy, No. III — Tree Guards. — *Ibidem*, pp. 11-13 + figg. 1.

United Kingdom: England

It is stated in the first of these articles, that since the larch has been introduced into England, now about two centuries, no other species can compete with it from an economic point of view, especially when it has been planted on soils and in situations which are adapted to its well-being and well cared for between the ages of 10 and 30 years, the critical period for larch plantations. The writer recommends sandy or light loamy soils, and an altitude of 600 to 700 ft.; he considers the Tyrolese variety the best. The Japanese larch is the more suitable kind on the heavier and damper soils. Lastly he advises plantations without admixture of other trees.

The following table, which gives the cost and expenses of a plantation of 24 acres made in 1890 upon a sandy loam soil at an altitude of 160 to 210 ft, and originally planted at 4 ft. apart:

Expenditure	Per acre		
	£	s	d
Cost of planting, including trees	7	10	0
Replanting trees and clearing for 2 years	0	16	6
Management expenses	2	14	0
Total . . .	11	0	6

Receipts	Per acre		
	£	s	d
By thinnings 1900	91	12	6
» » 1905	146	8	0
» » 1906-1911	74	0	0
Total receipts . . .	312	0	6

When the land was taken over for planting, it had been used as a sheep-run. The annual value of the land for agricultural purposes was about 6*s* per acre; the shooting rights are let, but the receipts from this source do not cover the rates and taxes.

An estimate of the present crop and volume of timber, gives 1014 trees per acre with a volume of 2408 cubic ft. According to the present rate of growth, there should be a final crop of 800 trees containing 4 800 cub ft. per acre, at the age of 45 years.

The present price of larch poles is 8*d* to 10*d* per cubic ft.

The second article gives no less interesting data concerning the thinning of a mixed plantation of larch and sweet chestnut. The plantation was only six acres in extent, and consisted of alternate rows of larch and chestnut, planted 6 ft. by 6 ft., the age of the trees was 40-42 years. The soil was heavy loam, the exposure north, but very sheltered; the ground had not been previously planted with timber.

The value of the thinnings was as follows:

	£	s	d
372 larch containing 4 239 ½ cubic feet .	168	16	0
136 chestnut containing 892 cubic feet . .	35	19	0
Poles sundries and small lots	30	11	8
Total . . .	235	6	8

Less :

Cost of felling, transport etc.	22 10 10
	£212 15 10

There remained on the 4 ½ acres, when the thinning was over, a nearly pure larch wood containing 520 trees averaging 15 ft. per tree, value at 10*d*, £325, or per acre £72-4-8 · or a fair value for the whole crop of £120 per acre.

Such a plantation should be established at the cost of £6 per acre, which compounded together with an acre rate of 5s in the £ yearly, after 42 years, at 3 %, brings a debit of £25 per acre.

The protection of trees planted in park or pasture lands against cattle is a subject of some importance. The Royal English Arboricultural Society gave special medals for tree guards at its recent exhibition at Norwich.

In Class 8 it was defined that the tree-guard should.

(1) Combine protection from stock and vermin.
(2) Be efficient and economical.
(3) Allow access for pruning and cleaning.

The cost of guarding each tree should not exceed four shillings, in addition to one shilling for planting. If this amount is exceeded, forestry ends and landscape gardening begins. For instance 50 trees planted on one acre, at 10 yards apart, would cost £12 10s. An acre enclosed and planted in the usual way would cost about the same, the profits on the thinnings being equal to the value of the herbage between the guarded trees.

The writer describes an economical type of guard used since 1908; it is 7 ft. high, as a special protection against young horses, though 6 ft. is, as a rule, high enough. Three creosoted larch poles are fixed by a creosoted poplar triangle. The three scantlings are fixed to the top of the poles by French nails. Barbed wire is also wound round and stapled to the battens.

The cost of these guards is 2*s*. 10*d* each

CAJANDER, A. K. **Forest Types on Moor Soil.** (Kangasmetsistä turvemaalla. Esitelmä, jonka piti Metsätieteellisen seuran Kokouksessa maraskuun 20 p · nä 1911). — *Suomen Metsänhoitoyhdistyksen Julkaisuja*, XXVIII, IV, V. 11, pp. 694-699. **519**

The Author considers the forest types of Southern and Central Finland : **Finland**

1. Fern	type	I principal type.
2. *Oxalis*	»	
3. *Myrtillus*	»	II principal type.
4. *Vaccinium*	»	
5. *Calluna*	»	III principal type.

Types 2-5 were found not only on ordinary mineral soil but also on moor soil of a thickness of 1.15 m. (3 ft. 8 in.) to 4 m. (13 ft.) and more. Consequently as the mineral soil examined included the descriptions sandy, loamy, clayey and detrital, it would seem to be proved that the forest types in question are to some extent independent of the petrographical and geological nature of the soil when the other conditions of vegetable life are nearly equal.

Consequently, the origin of these forest types in moor soil is due to the easy outflow of the excess of water taking place on the boundaries of the peat bed, so that these peat moors can be regarded as possessing a kind of natural drainage. Here this conclusion may be drawn, very important from the practical point of view, that if peat lands are artificially drained they can be gradually transformed into normal forest stands. The problem then arises of determining the type of forest into which a given type of peat moor can be transformed by means of drainage, taking account of the essential factor — the energy of growth — which differs to a noticeable extent according to the forest type

520 KUBELKA, AUGUST. **The Intensive Cultivation of High Mountain Forests.** — *Die intensive Bewirtschaftung der Hochgebirgsforste. Voraussetzungen in Bezug auf Bringungswesen, Betriebseinrichtung und Wirtschaftsformen*, pp. V + 86. Wien, 1912.

Germany

The writer shows that it is an absolute necessity for every forest owner, especially if his property consists of high mountain forests, to adopt the most intensive cultivation possible.

One of the first steps to take in this direction, is the establishment of efficacious, modern and powerful means of transport, without which forest exploitation in the high mountains is impossible, and which is absolutely necessary on account of the high price of timber.

This is the first and most important point which the owner should attend to in his own interests. Next comes the question of the local management of the forest which increases the productivity of the soil by obtaining a good yield of timber, which shall be regularly felled. It is only by such a local management that it is possible for the forester to take the necessary measures to ensure the highest yield of which the soil is capable, and a maximum and sustained volume of timber.

The sooner the owner resolves to adopt more modern methods in mountain forests, the sooner will his efforts be crowned with success, and his invested capital bring him in high returns.

It is not necessary that he should at once give all the capital which will be required; this will be provided by the forest itself, at least in those districts where there is a rich supply of mature wood. By employing this capital in the organization of the means of transport, it can at once be reimbursed by having recourse to the supplies of mature wood, this proceeding appearing to be completely justified economically.

Care must however be taken that forest improvement considerations do not come into conflict with such measures as have for their aim the preservation and increase of the soil fertility; in other words a distinction must be drawn between the chronometric and local measures, striving to carry out both according to the principles of Prof. Wagner. (1)

To sum up: it is necessary to regard the sections as independent economic units, and to reduce excessively long rotation intervals to those of a more suitable duration, employing differential treatment with due regard to the condition of the soil and of the various trees.

In this manner, forest management is refounded on more natural and simple principles; natural reproduction is made use of in those parts of the forest where abundant seed is produced, and artificial measures are employed where they appear necessary. The result is mixed plantations with natural differentiation in place of pure stands.

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(1) *Die Grundlagen der räumlichen Ordnung im Walde.* Tübingen, 1907. (Zweite verm. u. verb. Aufl. Tübingen, 1911).

The forest management scheme proposed by Prof. WAGNER consists essentially in giving preference to natural reproduction, in so far as it gives rise to trees suitable to the locality and to mixed plantations.

The course to pursue to attain this aim, would be to fell the forest in strips from east to west beginning on the north side; a clearing should first be made to give a start to natural reproduction. In theory there would be, in the end, beginning from the north side, a threefold series: (*a*) clearing, (*b*) natural regeneration with shelter, (*c*) complete stand of young trees. Artificial reproduction is only resorted to as a supplementary measure. (*Ed.*).

of spruce, for instance, which being artificial, are therefore not calculated to produce a fruitful and sustained forest yield.

Clear-felling large areas is a practice which will fall into disuse, for in the case of high mountains, this system is economically a mistake, for on the one hand, it entails great expense in replanting and, on the other, it causes great loss in increment. As a proof of this, the writer cites a characteristic example: —

Situation: 75 hectares (185 acres) on good soil on south-west slopes of high mountain.

Area and Contents: 800 cub. m. of wood 120 years old per ha. (11 400 cub. ft. per ac.).

Treatment: Clear-felling begun 40 years ago, and completed at the end of ten years.

Cultivation expenses: planting and filling up gaps . . .	£. 1 875
Loss in yearly increment	» 3 750
Total debit . . .	£ 5 625

Debit about £30 per acre.

With the selection system and natural regeneration with shelter, it would have been possible to make a natural plantation 30 years old.

521 LINDHOLM, WALTER. **Number and Average Distance of Standing Trees.** (Runkojen lukumäärä ja Keskivälimatka). — *Suomen Metsänhoitoyhdistyksen Julkaisuja*, XXVIII No., Vol. 11, pp. 700-704 + fgs. 4.

Finland

The Author sets himself to solve the following problem. which is of very great practical interest: How should the average distance between the trees in a wood be calculated, given the area and the number of trees?

Assuming an ideal wood, in which all trees are equidistant, the Author concludes that the average distance between the trees corresponds to the shortest diagonals of the areas of incidence, *i. e.* of the vertical shadow of the trees, when these areas are represented by a rhomboidal or a hexagonal system.

In both cases the interval may be calculated by means of the following formula:

$$d = \frac{107\ 457\ldots}{\sqrt{n}}$$

in which d is the average distance and n the number of trees per hectare. By the aid of this formula the Author prepared a table which is appended to the text.

It must further be noted that as compared with the interval thus calculated, that regarded as a side of the square equivalent to the area of incidence is too small, according to Pressler, while the diameter of a circular area of incidence is too large.

The Author refers to the difficulty met with in the practical use of the coefficient of interval, *i. e.* the ratio between the interval and the normal diameter of the trunks of trees, especially in the estimate made according to Bretschneider and others. This becomes of great importance in consequence of the fact that the average diameter is calculated from the average of test areas, and not directly as the average of the different diameters; for this reason the points of departure of the estimate prove to be the average interval and the average area of incidence. Furthermore, by using the interval coefficient obtained by direct arithmetical calculation, errors are also made, the magnitude of which depends on the divergence of the extreme values in comparison with the average, this divergence being greater in proportion as the shape of the wood is more irregular.

LIVE-STOCK AND BREEDING

ANATOMY AND PHYSIOLOGY.

MALSBURG, Prof. Dr. Karl von der. **Size of Cell as a Factor in Shape and Productiveness of Farm animals**. (Die Zellengrösse als Form-und Leistungsfaktor bei den landwirtschaftlichen Nutztieren). — *15. Flugschrift der Deutschen Gesellschaft für Züchtungskunde*. Hannover, 1911. **522**

Germany

The endeavour in modern zoology to trace biological questions of breeding back to their ultimate causes, and the references of

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(1) Published in No. 10 of the *Arbeiten der Deutschen Gesellschaft fur Züchtungskunde*.

prominent men in this branch to a diversity in the constitution and finer bodily structure of different animals, prompted the author to enter upon a thorough investigation (1) as to the essential nature of these differences. As the subject of his enquiries he chose the smallest units of the animal body, namely the cells.

He found that the size of a cell stands in a close relation to the vital processes of which it is the seat and that consequently the size of the cell forms an expression and an objectively tangible (microscopic) distinctive feature of its biological character, *i.e.* its individual peculiarities. The fact that a cell expands in three directions is conditioned by its function ; it cannot, however, exceed a certain size without at the same time unfavourably affecting its life conditions. When a body grows in size, its surface increases by the square or second power, but its volume by the third power. Now the cell has nothing but its surface as the gate of entrance for nutrition and oxygen and as the exit for the products of metabolism. This gateway therefore grows smaller in relation to the bulk, in proportion as the latter increases. It is for this reason that the smallest cells show the highest vital power. This smallness is sought to be permanently secured by the cells beginning to split up as soon as they have reached a certain size. Cell division is therefore an inner necessity arising out of growth, a fact already pointed out by other enquirers.

If the plasm of a cell takes up too much water of imbibition (the water surrounding each molecule) the molecules are forced further apart by the thicker water layers lying between them, and this reduces their action on each other and also the action on them of external influences. Therefore metabolism will proceed but slowly and the consumption of food-materials and elimination of metabolic products will fall off. A cell thus reduced in activity will not be compelled to split up so soon because its smaller exchange of materials can still continue when the ratio of the volume to the surface has become less favourable. Such a large coarse cell will also assimilate a great deal, because its larger contents of water facilitate solution of the food-materials supplied ; and, consuming little as mentioned above, it will grow rapidly, but on the other hand will possess less vital energy : this is the property shown by the cells of early maturing animals

There may also be a third class of cells in which the cell plasm is enfeebled from the out-set by some circumstance and therefore works defectively. To enable the cell to work at all, however, it must be very favourably constructed, *i.e.* as small and tender as possible. Of all kinds of cells this is the lowest in value.

If we now regard the organism as the outcome of its constituent parts, *i.e.* its cells, we can divide them into three classes:

1. Fine celled.
2. Coarse celled.
3. Tender celled.

The result of these theoretical considerations finds confirmation in nature. As far back as the forties of last century Sir William Bowman had drawn up the following scale of the average sizes of cells for the animals in the 5 classes of vertebrates:

Fish	122 mikrons
Amphibia. . .	68 »
Reptiles . . .	54 »
Mammals. . .	44 »
Birds	34 »

This is a striking coincidence, but no chance one, between the intensity of the vital processes, the entire essential nature of the animals and the size of cell.

The American biologist, F. W. Conklin, in his work " The Cell Size and the Body Size " points out that the cell size conditions the body size of the animal within a species and that the differences between large and small animals of the same species are conditioned by the different sizes of their body cells.

Farming practice also allows for the difference in metabolism in large and small animals. Kellner established for oxen a higher starch value as the normal per 1 000 kg of live weight in proportion as the animals are younger, *i.e.* smaller.

FEEDS AND FEEDING.

SCHNEIDER, KARL **Is Winter Pasture possible and advantageous in Germany?** (Ist Winterweide moglich und vorteilhaft?). — *Deutsche landwirtschaftliche Tierzucht*, 16. Jahrgang, Nr. 4., pp. 41-42. Hannover, 26. Januar 1912. **528**

Most breeders think it impossible to turn out cattle to graze during the winter under German climatic conditions. Ten years ago **Germany**

(1) Situated in the Westerwald where the climate is very severe.
(*Ed.*).

the Author was still of the same opinion, but now winter grazing plays a considerable part on his farm (1). Not only foals but horned cattle, including cows out of milk and in calf, may be put out to graze during the day throughout the winter. These animals have a simple airy shed for their night quarters; in the morning the doors are opened and the animals immediately get out to the pasture land adjoining the shed; neither snow nor cold keeps them in the shed. This shows that they feel at their ease on the meadow, because they could return to the byre if they did not care to stay out.

The benefit of this process is two-fold :

1. The animals are thoroughly hardened and get a thick wooly coat, which protects them far more efficiently against cold and rain than the coat of the animals kept in the cattle shed during the winter. When the latter in the spring go out to pasture, they suffer from the cold, are soaked through to the skin in rainy weather and consequently lose weight during the first grazing period. The Author secures from ¼ hectare (0.6 acre) of good pasturage, during the summer, from 100 to 125 kilogrammes (220 to 275 lb.) gain in live weight in the case of 1 year old cattle or foals, 150 to 175 kg. (330 to 385 lb.) live weight increase in 2 year old cattle or 1 000 litres (220 gals.) of milk in cows. Comparative trials with animals kept in the shed during the winter and others let out on to pasture during winter, proved that the above gain in live weight is only attainable with the latter, as there is no arrest of growth in the spring.

2. Winter pasturing however not merely hardens the animals but supplies them with food. The Author manures his meadows in July and August with superphosphate and sulphate of ammonia and as a result a luxuriant growth of forage plants takes place in autumn; the animals then find their food outside until snow falls. Trial weighings showed that without any additional feeding in the house, from the 15th November to the 20th December 1911 there was still secured an average gain of weight of 10 kg. (22 lb.) per head.

The Author emphasizes the fact that winter pasturage is only possible when the pasture land is of sufficient area. Too many animals kept on the same area would break up the greensward too much and impair the growth of forage in the following year. He regards the sowing of spring rye (Johannisroggen) and winter barley on suitable soil as advisable for providing winter pasturage.

It should also be mentioned that calves on the farm we are dealing with are roughly reared; in the summer they live in a calf yard. where shelter is only offered by a board roof and a tree, and they pass the winter in a cool shed.

WAKERLEY, F. The Feeding of Dairy Cows in 1911. Linseed Cake versus Soya Bean Meal. — *Reports on Experiments with Crops and Stock in the Year 1910-1911*, pp 57-66. Midland Agric. and Dairy College, Kingston-on-Soar. 524

England

Soya bean meal is a residual bye-product resulting from the extraction of oil from soya beans, and it is placed on the market at what appears to be, from the analysis, a comparatively low price.

With the exception of the oil, it differs little from Soya bean cake and as the oil in the cake, when fed to cows, has been accused of influencing the dairy products, the experiment was undertaken with a view to finding out whether any ill effects were noticeable when the substance used was deprived of most of its oily ingredients.

The Object of the Experiment.

1) To contrast the bye-product Soya bean meal with linseed cake in a mixed ration for cows, taking note of its suitability for milk production.

2) By comparing the market price of the two foods of equal nutrients, to see which is the cheaper source of concentrated food.

3) To determine the relative effects of the foods on quality of milk, as determined by Gerber (fat percentage), and butter, as derived from the churning of a representative sample of cream.

The animals were selected and placed on preliminary feeding on Jan. 22nd and continued to receive a mixed ration in which 5 lbs. undecorticated cotton cake constituted the main concentrated food for one week At the end of this time, the cows were finally divided into two lots and weighed; feeding proper commenced on Jan. 29th and they continued under treatment for one month, *i.e.* each lot of four cows received the experimental foods for two weeks respectively.

The cows were divided into two lots of four each, the lots being balanced as nearly as possible in weight, milk yield and period of lactation.

The cows were cross-bred Shorthorns, some of which were reared on the farm and are representative of the type of cow kept in the College herd.

Their live weight ranged from 10-11 cwt. Weighings were taken on Jan. 30th when the experiments commenced; at the end of a fortnight, Feb. 13th, when alteration was made in the feeding; and again at the end of the experiment on Feb. 27th.

Rations per Day.

5 lbs Undecorticated cotton cake, or 4 1/2 lbs. linseed cake, or 4 1/8 lbs. Soya bean meal.

2 lbs. Mixed meal (bran, sharps, dried grain).

14 lbs. Hay.

7 lbs. Straw chop.

56 lbs. Mangels (a part whole) pulped and given with chop and meal.

Summary.

1) Both linseed cake and Soya bean meal gave good results when fed in mixed ration to cows.

2) Linseed cake gave a slight advantage in milk yield and live weight.

3) The manurial residue is higher from Soya bean meal.

4) When equal units of food are employed, at current prices, there is little to choose between the two foods.

BREEDING.

525 LAUGHLIN, H. H. **The Inheritance of Colour in Shorthorn Cattle.** — *The American Naturalist.* Vol. XLV, No. 540, pp. 705-742; No. 541, pp. 1-28. Lancaster, Garrison, New York. December 1911, January 1912.

United States

Shorthorn cattle often have offspring differing in colour from the parents; whether both parent animals have the same or a different colour of coat, it is always uncertain which of the three Shorthorn colours will appear in a calf to be born. This is illustrated by the colours of some of the cattle bred by Amos Cruickshank at Sittyton, which are set out in Table I (after R. Bruce).

TABLE I.

Colour of matings	Colour of offspring				
	Red	Red and White	Roan	White	Total
a) Red × Red	133	12	34	1	180
b) Red × Red & White	31	11	6	0	48
c) Red × Roan	278	25	265	0	568
d) Red × White	1	0	41	4	46
e) Red & White × Red & White	0	2	0	1	3
f) Red & White × Roan	22	22	40	2	86
g) Red & White × White	0	1	1	1	3
h) Roan × Roan	56	10	183	60	309
i) Roan × White	0	0	12	12	24
k) White × White	0	0	1	2	3
	521	83	583	83	1 270

A further Table, worked out on the basis of pedigrees (after Wentworth) shows that from the pairing of different coloured Shorthorns 127 white, 645 roan and 892 red calves resulted. Want of space precludes our reproducing the other examples quoted by the Author; we may only adduce a single case in which a white calf was bred from two red parents (after E. M. Hall, see p. 725).

In connection with his data concerning the colour of Shorthorns, the Author suggests the following hypothesis in explanation of the three-fold colour.

In Shorthorn cattle there exist intermingled two genetically independent sets of hairs, which form the characteristic colour markings of this animal.

One set is alternatively *positive white* (*W*) and *red* (*R*), white being dominant and red recessive; the other set is alternately *red* (*R*) and *albinic white* (*wr*), in which red is dominant and white recessive. The dominant white is formed by an anti-body present in the zygote, which retards or completely prevents the development of the determinants of any colour. The same anti-body in

a larger quantity destroys the colour determinants and thus forms recessive white (albinic white), which occurs in albinism.

It may be assumed that the dominant white originates from the Romano-British cattle and recessive white from the Dutch **cattle; it represents a strain of partial albinism. Coarse mosaic** or spotted colour pattern sprang from Dutch bulls imported in the 18th Century. The spots of Group I (dominant white) are found on the fore and hind flank, the under line and the median line of the body, above the face and a fine network extending over the remainder of the body. Group II (recessive white) covers the neck, sides, back, hind quarters and legs in a network exclusive of the areas of Group I.

The Author uses the following symbols

W = Inhibitor of pigment formation.
w = Absence of such inhibitor
R = Determiner for red pigmentation.
r = Absence of determiner for red pigmentation.

With reference to Set No 1, or group - unit No. 1, individual cattle are gametically $W_2\ r_2$, $Ww\ R_2$ or $w_2\ R_2$, with reference to group unit No. 2 they are $w_2\ R_2$, $w_2\ Rr$ or $w_2\ r_2$. There are therefore involving these characters nine gametic and three somatic types of individuals, which types are set forth in the following table

TABLE II.

	Gametic Composition		Somatic Aspect	Blood	Unit Purity	
	Set 1	Set 2			Set 1	Set 2
1	$w_2\ R_2$	$w_2\ R_2$	Red	Pure	Duplex	Duplex
2	$w_2\ R_2$	$w_2\ Rr$	Red	Mongrel	Duplex	Simplex
3	$w_2\ R_2$	$w_2\ r_2$	Roan (1)	Pure	Duplex	Nulliplex
4	$Ww\ R_2$	$w_2\ R_2$	Roan	Mongrel	Simplex	Duplex
5	$Ww\ R_2$	$w_2\ Rr$	Roan	Mongrel	Simplex	Simplex
6	$Ww\ R_2$	$w_2\ r_2$	White	Mongrel	Simplex	Nulliplex
7	$W_2\ r_2$	$w_2\ R_2$	Roan	Pure	Duplex	Duplex
8	$W_2\ r_2$	$w_2\ Rr$	Roan	Mongrel	Duplex	Simplex
9	$W_2\ r_2$	$w_2\ r_2$	White	Pure	Duplex	Nulliplex

(1) Roan in this Table denotes any animal with **white and red hair in a coarse** or fine mixture, **without regard to proportion or pattern.**

Now, if two sexual cells of the structure indicated in Table II combine, 45 different mixtures are possible. These mixtures explain the fact that many Shorthorn animals look like mongrels; the cause lies in the different behaviour of two genetically independent units contained in it.

In Table III we give a few examples of the 45 possible combinations; the whole of this Table can unfortunately not be reproduced for want of space.

It frequently happens with these matings that the same parental elements enter and the same offspring in point of aspect may be expected, but these elements are differently combined in the individual animals. Examples of this are numbers 8 and 9, numbers 19 and 20 and numbers 34 and 35 in Table III; the figures in question are connected by an arrow.

If red Shorthorns are mated as in No. 30, Table III, there result about 75 % of red and 25 % of roans. There are however reds which will produce only reds as in matings No. 6 and No. 15 (see Table I*a*). If roan parents generate white offspring, this may be due to a mating like No. 25 or No. 26 (1/4 of the products are white), or from a mating such as No. 28 (3/16 white), or also No. 34 (1/2 of offspring white). The product itself from the point of internal structure, is either like type 6 or 9, Table II. Paired with other red Shorthorns it would produce only roan calves with a mating like No. 20; with a mating like No. 23 there would result 50 % of roan and 50 % of red, and with a mating like No. 35 50 % roan and 50 % white; in a mating like No. 42, if the white were mated with a roan, only white calves would be produced.

Pairing roan with roan, a high percentage of roan results (see Table I, *h*). This suggests that many roans are pure. In No. 1 (Table III) roans are really pure and produce only roan posterity of similar germ cell structure to the two parents. In matings 8, 9 and 19 roans spring from roans but with dissimilar structure.

A white calf from two perfectly red parents is either of very rare occurrence or does not occur at all (Table I. *a*). A case of this kind was cited above (M. Hall); this may be a case of mutation or such an animal may also be regarded as a complete albino. It is much more probable that both parents are never entirely red, and therefore, keeping to the nomenclature of this article, can be described as roan. The explanation of the manner in which they produce a white calf is then easily found (Table III, 25, 26, etc.).

The form of the different colour markings in the Shorthorn hair coat, is explained by the fact that generally the darker pigments are dominant over the lighter, covering the latter, in the order: black, red, yellow, albinic white, the preceding colour always covers all following ones. Dominant white however is not covered by any colour: it is dominant over all (as an example Davenport's experiments with the Silkies and Leghorn Fowls are quoted). If, then, the white Shorthorn coat be regarded as a mixture of dominant and recessive (albino-white) and an animal of this white be paired with a red Shorthorn (duplex red), the red covers the albinic white and the latter therefore appears red; the dominating white remains, and as both whites form a network over the body, there result the well-known roan-coated animals. Spottiness or a mosaic mixture may arise if the network is coarser. If a white Shorthorn of type No. 9 (Table II) is paired with a black Angus animal, the black covers the albinic white and there result the well-known blue-roan hybrids in full agreement with the theory here developed. In mating Angus with Herefords, black covers the red, but not the dominant white of the forehead. It may consequently be supposed that the different Shorthorn colours arise from intra-zygotic reactions, but that the last units are not altered, and may appear in other combinations in the posterity

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR ENCOURAGEMENT OF BREEDING.

UJHELYI, IMRE. **Report of the Cattle Breeding Association of Magyaróvár on the Working Year 1910-1911.** (Jelentés a magyaróvári szarvasmarha tenyesztö egyesület 1910/11). — *Tizenotodikévi müködéséröl.* Magyaróvár, 1911. **526**

Hungary

We extract from the Report of the Magyaróvár Cattle Breeding Association on the working year 1910-1911, the fifteenth since the foundation of the Association, the following particulars:

M. Imre Ujhelyi, Secretary of the Association, reports that the results of the year ending on the 30th September 1911 have been very favourable, and the most remarkable fact has been that the sale by public auction of breeding bulls reared by members gave an excellent result, and that furthermore the members, most of them small peasant proprietors, obtained for young bulls 15 months old up to 3 000 crowns (£125) a price with which breeders of pure Simmenthals might also be satisfied.

The association organised milking competitions in three communes, in order to increase the milking capacity of the cows owned by members.

The commune of Levél gave fairly good results in this connection and the Association has taken the necessary steps for extending these competitions in the future in several communes of the Comitat.

The Association has greatly fostered cheese manufacture and has also endeavoured to introduce the production of hard cheeses into the Comitat.

As to pig breeding, the Association being insufficiently supported by the State, was unable to attain noteworthy results.

In order to rationalise the design and equipment of sheds and byres, the Association provided prizes of 100 crowns (4 guineas) to be paid to farmers who built their cattle houses according to the plans of the Association and in keeping with hygienic requirements.

The Association sold by public auction on the 25th February 1911, 20 bulls from 1 to 2 years old at the average price of 1030 crowns

(£42.18*s*) with a minimum of 600 crowns (£25) for a yearling and a maximum of 1470 crowns (£61.5*s*) for a two-year-old.

It sold by private treaty 25 animals from 15 months to 2 ½ years old, two of them being young bulls of 15 months at the price of 2 000 crowns (£84) and 3 000 crowns (£125) respectively. These two animals were the offspring of dams which had gained first prizes in the milking competitions.

The Association directed its main endeavours towards securing that only the offspring of excellent milking animals should be used for breeding; it attributed far less importance to the question whether the animals used for breeding exhibited in their physical features all the characters of the breed selected for raising (Simmenthal breed).

The herd book kept by the Association contains exact particulars of the animals possessed by the members, and for purposes of sale the Association supplies members with authenticated certificates extracted therefrom concerning the animals to be sold.

The Association also fixes prizes every year for the finest heifers. In 1911, in the three districts of the Comitat, the Association distributed 60 prizes totalling 1 500 crowns (£62.10*s*). 75 small proprietors belonging to 11 communes took part in these competitions, with 86 animals, of which 58 carried off prizes.

The milking competitions referred to above took place in the communes of Levél, Lébeny and Hegyeshalom. The following are the results in the Commune of Levél where the fifth competition since the foundation of the Associatian was held.

Years —	No. of Cows	Average yield in gallons	Contents of Fat
1901	23	517	3 70 %
1904	79	586	3 73 %
1906-07	33	650	3 92 %
1908-09	28	714	3 67 %
1910-11	51	743	—

The members therefore took part in the competition in large numbers in spite of foot-and-mouth disease which caused many ravages; the results show that the favourable influence of the competitions has become more pronounced in the higher average of milking, their being an increase of about 30 % during the period.

The results obtained by the Association as an intermediary in the purchase of chemical manures and seeds of forage crops were likewise very interesting. The quantity of seed distributed in 1910-11 was about 225 qls. (over 22 tons) and of manure (superphosphate) 48 wagons.

The Association continued experiments for several years on the manuring of moor pastures. They found that the use of 200 kg. of superphosphate and 75 kg. of potash per arpent cadastral (about 2 ½ and 1 cwt per acre) yielded an extra crop of 450 to 4 800 kg. (6 ½ cwt. to 3 tons 6 cwt. per ac.). The quality of the hay on the grasslands thus manured was much superior to that of the unmanured lands and the proportion of good grass had undergone notable increase.

The report of the Association also contains particulars concerning the number of animals in the Comitat; from it we extract the following table for the years 1910 and 1911.

	NUMBER OF						
	Cattle	Buffaloes	Horses	Pigs	Sheep	Goats	Asses
1910 . .	51 257	114	14 894	33 669	4 754	2 683	35
1911 . .	50 074	69	15 244	37 764	4 356	3 151	60
Difference	— 2.3 %	— 39 %	+ 2 3 %	+ 12.1 %	— 8 4 %	+ 17 4 %	+ 71 %

Co-operative Dairy Societies in operation in the territory of the Association numbered 17 at the end of 1911, the number of members being 1865 with 3 315 milch cows. The quantity of milk supplied by members during the working year 1st July 1910 to 30th June 1911 was 3 079 519 litres (about 677 750 gallons), of which 972 784 l. (214 100 gal.) were used for butter making, 693 013 l. (152 500 gal.) for cheese making and 1 413 722 l. (311 150 gal.) were consumed in their natural form.

The butter production was 39 921 kg. (39 tons 5 ½ cwt.) that is to say 4.1 kg. per 100 litres (41 lb. per 100 gal.) of milk, and cheese 73 225 kg. (72 tons 1 cwt.) or 10.59 kg. per 100 litres (106 lb. per 100 gal.) of milk.

It is clear from the accounts of the Magyaróvár Cattle Breeding Association for the financial year 1910-1911 that the receipts and expenditure have reached the amount of 204 494 crowns (£8 520 odd), and the Balance Sheet at the end of the year totalled the figure of 45 895 crowns (£1 912) with a profit of 15 486 crowns (£645).

527 De Lapparent. **Live Stock Shows and Prizes.** (Les Concours de primes encouragent l'élevage). — *La Vie à la Campagne*, Vol. XI, No. 127, pp. 21-23. Paris, 1 Janvier 1912.

France

The general Paris Shows and those termed National, organised successively in various parts of France for the encouragement of agriculture, not being accessible to small proprietors who are too economically inclined to attend them, are insufficient, in a country with so many small and medium farms, to generalise progress, particularly in breeding.

Those who exhibit at these larger show are always the same: a sort of breeding aristocracy, and others who have been termed show professionals. Owing to their skill in selecting and preparing the animals to be exhibited they secure the majority of the prizes, and breeding generally does not benefit very much

Special *Shows of Breeds* which have been held since 1894 in a regular succession, in different towns of a breeding region, have not completely solved the question, as there still remains the superiority of the above mentioned competitors, and also the expense and loss of time to breeders at a distance from the show. For this reason the number of animals exhibited in these breeding shows has always been rather limited.

In 1907 an attempt was made at a reform of the special shows on the following bases, as regards the two breeds, Bordeaux and Pyrenean, in the South West:

1. The selection of a certain number of centres distributed throughout the region where the breed is raised.
2. The appointment of travelling judges.
3. The replacing of prizes of decreasing value by premiums divided into several classes.
4. The elimination of the age section.
5. Dispensing with preliminary formalities of entry.

Each breeder may bring to the show all the animals he thinks fit, which have at least the first permanent teeth; nevertheless one and the same breeder can only receive two prizes for males and three for females.

Bulls when too young, and females more than 12 years old, can only obtain medals. The prizes vary from 125 to 40 fr. (£5 to £1.12*s*) according to the classes. The judges, three in number, work on the score-card system to facilitate comparison of the animals submitted at different places. Furthermore, with a view to the instruction of breeders, the judges dictate their notes aloud and publicly to the Secretary, and after classification each breeder receives a duplicate of the score-card of his classified animals.

On the very first occasion some hundreds of animals were shown, and an increasing interest in these shows may be expected among breeders, so much so that breeders in other districts have demanded application of this new system to themselves.

Animals Imported for Breeding Purposes. — *Reports of the U. S. Department of Agriculture, Bureau of Animal Industry: Report for Horses*, p. 3; *Report for Cattle*, p. 3. Washington, December 14 and 16, 1911. **528**

United States

According to a report of the Ministry of Agriculture in the United States during the period 1st July to 30th September 1911 there were imported in all 1212 breeding horses and 317 breeding cattle. The following list shows to what breeds these animals belong:

I. — *Horses.*

Breed	Stallions	Mares
Belgian Draft	149	47
Clydesdale	34	18
French Draft	4	—
Hackney	6	9
Percheron	586	164
Shetland Pony	9	45
Shire	42	3
Suffolk	12	16
Welsh Pony	10	58
Total	852	360

II. — *Cattle.*

Breed	Bulls	Cows
Alderney	1	—
Ayrshire	14	99
Guernsey	5	89
Jersey	7	100
Shorthorn	2	—
Total	29	288

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Great Britain

Live Stock and Fresh Meat Imports into Great Britain in 1911. — *The Meat Trades Journal*, Vol. XXXV, No, 1237, pp. 46-47. London, January 11, 1912.

The imports of live stock and fresh meat into Great Britain in 1911 and the chief exporting countries may be seen from the following table.

A. *Imports of live stock.*

Country	Cattle	Sheep
United-States	155 816	42 805
Canada	42 239	4 868
Channel Islands	2 342	—
Total	200 397	47 673

B. *Meat imports.*

Beef	7 362 434	cwts.
Mutton	5 337 451	»
Pork . . .	452 932	»

The percentages contributed by different countries to these imports are:

	Beef %	Mutton %	Pork %
United-States . .	2,37	—	0,92
Argentina	83,89	34,83	—
Australia	13,15	61,32	—
Holland	—	2,13	81,76
Belgium	—	—	3,21
Other Countries .	0,59	1,72	14,11
Total	100,00	100,00	100,00

HORSES.

Kramer, H. The Mongolian and the so-called Assyrian Wild Horse. (Die mongolischen und die sogennanten assyrischen Wildpferde). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, 27. Jahrgang, Stück 3, pp. 33-37. Berlin, 20. Januar 1912. **580**

Germany

The descent of our different breeds of horses cannot be regarded as thoroughly elucidated at the present time. There is, it is true, no difficulty in conceiving that in prehistoric times primitive horse types differing little from each other became widely scattered in space. Then the animals living in the grass-growing low lands increased in bodily size and weight owing to plentiful nutrition, while in mountainous regions, owing to privation and unfavourable climatic conditions pony-like animals arose; finally in desert regions a specially speedy type of horse gradually developed, because in speed alone could salvation be found from beasts of prey, and further because a great deal of motion was required to secure a sufficiency of food from a sparse vegetation.

The zoologist Keller of Zurich adopts the view that the Oriental horse is also descended from *Equus Przewalskii* but this is the very instance in which the descent is not proved with certainty. If the Oriental horse has come from *E. Przewalskii*, there should be intermediate forms between the two types. As proof of the existence of such intermediate forms illustrations and bony remains lighted on by chance might serve. Tscherski has measured bones of this kind and found that the brain part of the head is broader than the average of the Arab horse, and that the supraorbital ridges likewise do not project above as with the Arab horse. From this he concludes that the two belong to different types. Noack found considerable differences between the tooth structure of *E. Przewalskii* and the Oriental horse and of these the Author has likewise satisfied himself.

Although he regards the descent of the Oriental horse from *E. Przewalskii* as very possible, he utters a warning against endeavoring to draw conclusions from the very inadequate material at present available. Though illustrations lighted on by chance have some value, they should not be over-estimated, because allowance must be made for the personal and not strictly objective element in the artist's reproduction of the animal. Likewise the bones found up to to-day do not suffice to settle the question. If minutely accurate measurements of single animals or individual bones are made, and the relationship between different types asserted or denied on the basis of the results, mistakes are inevitable. The Author hopes, nevertheless, that the investigations of natural science, and examination of bones, will yield more precise information on the present question if more plentiful material can be found.

581 SCHULZE, C. **Investigations into the Growth of the Hoof of Horses.** (Untersuchungen uber das Wachstum des Hufhorns der Pferde). — *Deutsche Landwirtschaftliche Presse*, 39. Jahrgang, Nr. 7, pp. 67-68. Berlin, 24. Januar 1912.

Germany

The Author examined the growth of the hoof by measurements carried out on 800 hoofs; the chief results of his work are as follows:

1. The growth of the wall of the hoof averages 7.66 mm. per month. Unshod hoofs grow 8.6 mm. on the average per month, and shod hoofs only 6 73 mm.

2 The rapidity of monthly growth ranges, for unshod hoofs, between 4 4 and 9.3 mm.

3. The average growth may be greater in one month than in another.

4. The fore and hind hoofs grow at about the same rate, but the rate of growth of the different hoofs is seldom quite uniform.

5. The hoof growth around the coronet is uniform in 90.6 % of all hoofs and irregular in 9.4 %. Irregular growth rarely occurs with regular shapes of hoof.

6. When unshod hoofs are shod, there is an arrest of growth. Good care of the hoofs and good shoeing, especially that method of shoeing by which the hoof approximates more to natural conditions (seated shoes and half-shoes) may reduce this injurious effect.

7. The hoofs of horses aged from 5 to 10 years have on the average a monthly growth 0.28 mm. faster than the hoofs of horses aged from 11 to 19.

8. The colour of the hoof has no relationship to its rate of growth.

9. The duration and description of work does not affect the rapidity of hoof growth to any ascertainable extent.

10. In foundered hoofs the heel possesses a more powerful growth than the toe and quarters. In hoofs shod with bar-shoes

the toes grow 2-5 mm. more per month than the remaining wall sections. Injuries to the hoof coronet give rise to an additional growth up to 7 mm. per month in the corresponding part of the wall.

11. Single dressings with Cantharis ointment or cauterisation of points on the coronet usually results in an increased growth of 3 mm. in the wall in the month following. A better result is obtained by frequently repeated dressings with ointment, but there is no specific capable of permanently increasing the horn production.

12. Hoofs in which the volar or plantar nerves are severed grow on the average 2-5 mm. per month more than sound hoofs.

13. General diseases as a rule lead to no arrest of hoof growth; indeed there is often an enhanced growth after recovery from a disease. The hoof horn however becomes dull when the animal is ill and shows a deficiency in moisture and elasticity.

SHEEP.

THILO, HANS LUDWIG. **The Objects of Intensive Sheep Breeding.** (Ziele des intensiven Schäfereibetriebes). — *Deutsche Landwirtschaftliche Presse*, 39. Jahrgang, Nr. 4, p. 29. Berlin 13. Januar 1912. **582**

Germany

Sheep breeding must not be made secondary to intensive crop growing, but it must be adapted to the latter; if this is done its continuance even on farms devoted to the most intensive crop growing, such as sugar-beet farms, is not only possible but is necessary, because fodder which can only be turned to account by sheep is found everywhere. It should not be our aim to breed sheep with the finest possible wool, but raising lambs should be the main source of revenue and the wool regarded as a by-product; like straw in the case of grain.

The sheep should reproduce as young as possible, from 1 year to 18 months. The Author says that his experience proves this to be perfectly feasible in practice. It is precisely the very early maturity of the sheep which forms a very valuable property, and gives it a great superiority over large cattle.

If lamb fattening is carried on, the food used is converted into money after a maximum of seven months, because at this age the lambs are ready for the butcher. If pigs are fattened so young, why should the like process not be applicable to sheep? The sooner the lambs are ripe for the butcher the cheaper is the fattening, the less the risk, and the better the quality of meat. According to H. Fischer, " Lehrbuch der vergleichenden Histologie " p. 114, it is the young cell which is the most capable of assimilating, and K. v. d. Malsburg also points out in his book: " Die Zelle als Form- und Leistungsfaktor unserer landwirtschaftlichen Nutztiere " that in the young organism all other cell functions are restricted to a minimum in favour of growth. The young cell however also forms but little protective substance against disease germs, and therefore it cannot be otherwise than an advantage to send the lambs to the slaughterhouse as young as possible. Finally the quality of the young meat is due to its large contents of muscular substance and the small proportion of fat therein.

Intensive feeding when young should however also be practised for lambs intended for later breeding, because it results in earlier sexual maturity and further develops the precocity of the breed. The breeding stock should be perfected by pure breeding if a breed is available or has been created corresponding to the particular conditions. Fatting lambs however are best produced by crossbreeding, in order to secure the maximum fattening powers.

If two lambing times are arranged for, one in the middle of October and the other in the middle of May, the labour of the feeder will be uniformly utilised almost throughout the year with a 7 to 9 months fattening period.

The future will show whether lambing twice a year is feasible with sheep. The Author has already begun to carry out in practice the methods sketched out here, and he thinks it desirable that his principles should be further and more generally followed up.

GOATS.

588 SPRINGFIELD, K **Should Goats be Distinguished by the Use of Ear Markers or by Tattooing?** (Kennzeichnung der Ziegen durch Ohrmarken oder Tätowierung ?) — *Zeitschrift für Ziegenzucht*, 13. Jahrgang, Nr. 2, pp. 24-26. Hannover, 15. Januar 1912.

Germany

Markers on the ears should not be employed for distinguishing breeding goats: whatever system is adopted, there is always the possibility of the animals, during pasturage or in the shed, getting the ear marker caught and slitting their ears, which mostly means the loss of the marker as well. These drawbacks may be avoided by tattooing the signs (numbers or letters) on the ears. The cost of tattooing scarcely exceeds that of the ear marker system. Good tattooing pincers with interchangeable types and a little German black and spirit is all that is required. Tattooing nippers with several spaces are used, into which several types can be inserted. It is advisable to put on one ear the Herd Book number of the corresponding animal, and transversely thereto (horizontally) to tattoo the association mark, while in the other ear the number of the dam, and to it a figure indicating the year of birth, are tattooed.

PIGS.

SPENCER, SANDERS. **Green Food For Pigs** (1) - *Live Stock Journal for 1912*, pp. 193-196. London. **584**

Great Britain

The old method of rearing pigs on very short diet and then rapidly fattening them with large quantities of barley meal or other expensive foods is no doubt well adapted for the production of very fat pigs, but they hardly fetch as high a price as animals fed from their early days with comparatively cheap food but a sufficiency of it, who have therefore been able to build up their body. Animals fed in this latter way yield excellent meat instead of the excessive quantities of fat found in pigs fed on the old method; besides this they are ready for the market much sooner.

A method of feeding having much to recommend it is summer pasturing. Mr. Spencer reports on a farm in an English midland county, where between seven and eight hundred pigs are annually folded on permanent or temporary pasture. The animals are bought when about 10 weeks old, and are then, in addition to pasture, given a small daily ration of sharps in the form of thin slop, and also mangolds and cabbages; later on, when the pigs grow stronger, they are given peas and beans instead of sharps. Towards the end of August the largest animals are put into yards and fed on various meals, with an addition of green fodder. In the course of two or three months they are sold off fat. The results of this method of pig fattening are highly satisfactory.

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(1) See also *B*. Feb. 1911, No. 374. (*Ed.*).

The Author further says that pig fattening with meal exclusively is more expensive than if a mixture of meal and potatoes is fed to them. He refers in proof of this to the experiments of the Wisconsin Experiment Station, in which it was found that with pure maize meal feeding 440 lb. of maize meal were required to produce 100 lb. increase in live weight. This same increase in live weight was secured by means of 262 lb. of maize meal and 786 lb. of cooked potatoes. (Ratio of maize meal to potatoes = 1 : 3).

585 MEYER, GEORG. **The Value and Digestibility of Foods.** (Uber den Wert und die Verdaulichkeit der Futtermittel). — *Mitteilungen der Vereinigung Deutscher Schweinezüchter,* 19. Jahrgang, Nr. 2, pp. 29-32. Berlin, 15. Januar 1912.

Germany

To make pig fattening successful, everything detrimental to the well-being of the animal must be avoided, such as dark and bad sties, irregular meal times and badly composed, poor flavoured food mixtures. The breed is also an important point: highly bred pigs derive more benefit from their food than the common stocks.

Pigs digest young green fodder better than old, in which the fibres have become woody. According to the experiments of Professor Lehmann, of Göttingen the following is the percentage digested of the substances contained in red clover:

		Organic matter %	Protein %	N-free extract %	Crude fibre %
Pig	Red clover, young, without flowers	54	49	71	24
	Red clover, beginning to flower	40	33	57	16
Wether	Red clover, beginning to flower	66	71	74	47

On the strength of careful feeding experiments Professor Lehmann divides foods for pigs into three classes, according to the proportions of organic matter digested:

Class I over 90 %		Class II 80-90 %		Class III below 80 %	
Potatoes	94 %	Barley	81 %	Palmnut cake	68 %
Sugar beets	95 %	Wheat	83 %	Bran	67 %
Beetroots	90 %	Beans	80 %	Rice meal	66 %
Maize	91 %	Cocoanut cake	80 %	Brewers' grains	48 %
Peas	91 %	Linseed cake	80 %	Green fodder	40-54 %
Meat meal	92 %	Dried beet slices	80 %	Ensilaged beet leaves	70 %
Milk	95 %	Ensilaged beet slices	80 %		
Molasses	100 %				

The effects of the foods are mutually supplemented and completed by mixing, and any harmful properties a particular food may possess are thus toned down.

528 RICHARDSEN, Prof. Dr. **Pig Fattening Experiments with Dried Yeast in Comparison with Meat Meal.** — *Deutsche Landwirtschaftliche Presse*, 39. Jahrgang, Nr. 5 and 6, pp. 42-43 and pp. 49-50. Berlin, 17. and 20. Januar 1912.

Germany

Breweries have begun to prepare a food from yeast by drying. Up to now not much experience is available on dried yeast feeding. The Author therefore from the 20th July to the 25th October 1911 carried out a feeding experiment on six pigs (Yorkshire crossbreds) three of which were given dried yeast in addition to other food. The animals were the offspring of two sows and were born on the 29th and 31st December 1910. For the experiment two groups (*A* and *B*) each of three pigs were formed. The experiment itself was divided into two periods.

The following was the composition of the foods used, found by analysis:

	Dry Matter %	Protein %	Fat %	Nitrogen-free extract %
Barley	87.64	12.26	2.15	63 98
Sliced potatoes	90.11	4.01	0.22	77.74
Meat meal	90.56	80.56	8.16	—
Dried yeast	90.86	42.30	0.35	34.60
Linseed	93.16	21.69	34.56	23.62

The following quantities of food were given per 1 000 lb. live weight per day:

PERIOD I.

Group A: 20 lb. barley meal; 12 lb. potato slices; 3 lb. meat meal.

Group B: 20 lb. barley meal; 9 lb. potato slices; 6 lb. dried yeast and 1 lb. linseed.

PERIOD II.

Group A: 18 lb. barley meal; 10 lb. potato slices; 2.5 lb. meat meal.

Group B: 18 lb. barley meal; 7 lb. potato slices; 1 lb. linseed.

In addition the pigs were given 1/4 oz. of rock salt and phosphate of lime each, per day.

The linseed was fed to Group B to give the ration the necessary admixture of fat.

It was at first feared that the dried yeast would be distasteful to the animals in consequence of its bitter flavour, but in all cases they entirely cleared up their ration; there were also no health troubles when the proportion of yeast was gradually raised from 0.8 lb. to 1.2 lb. per head per day with increase of live weight. The daily gain in live weight per animal averaged 1.39 lb. in Group *A* and 1.29 lb. in Group *B*.

Altogether in the course of 98 feeding days an increase of 396 lb. in live weight was secured in Group *A* and of 380 lb. in Group *B*. When the pigs were killed Group *A* was found to have a dead weight of 79.01 % and Group *B* 79.32 %.

The Author does not think that the rather low increase in live weight found under yeast feeding forms any obstacle to the general use of dried yeast for pigs, chiefly as an accessory in the place of meat meal or similar foods. The price moreover should not be more than 60 % of that of meat meal.

POULTRY.

587

Pearl, Raymond and Maynie, R. Curtis. **Studies on the Physiology of Reproduction in the Domestic Fowl. V. Data Regarding the Physiology of the Oviduct.** — *The Journal of Experimental Zoology*, Vol. 12, No. 1, pp. 99-132. Philadelphia, January 5, 1912.

United States

The oviduct of the domestic hen consists of five parts: the infundibulum, the albumen-secreting portion, the isthmus, the uterus and the vagina. The Authors, by weighing normally laid eggs, and by exceedingly accurate determination of the weight of the different parts (shell, membranes, white and yolk), and likewise by dissection of hens and careful examination of the eggs taken from the oviduct, have tried to find out the way in which the several parts of the oviduct co-operate in the formation of the egg.

They found that the yolk, after entering the infundibulum, remains more than three hours in the albumen portion of the oviduct but only receives here from 40 to 50 % of the total weight of albumen in the egg and not the whole of the albumen as was hitherto supposed. In the portion of the oviduct just referred to there were formed the chalazae, the inner layer of fluid albumen and the dense albumen.

The egg passes through the isthmus in something less than an hour; in the isthmus it receives the shell membrane. At the same time, and also during its subsequent stay in the uterus, the outer layer of fluid albumen is formed, the weight of which is 50-60 % of the total weight of albumen.

This thin albumen is taken up by osmosis through the egg membrane; on entering the egg it is much more liquid than in the laid egg. A diffusion process now takes place in the egg, by which the albumen first formed becomes thinner and that entering the egg later thicker in consistency.

The increase of albumen is only completed after the egg has remained for five to seven hours in the uterus. Before the absorption of albumen is quite terminated the formation of the shell begins, which requires from 12 to 16 hours for its complete development.

588 WILSON, W. A. **Government Poultry Fattening Stations in Saskatchewan, Canada.** — *Dept. of Agric of Saskatchewan, Bulletin* No. 25. pp. 1-32. Regina, Sask., Canada, 1911.

Canada

Owing to the general disregard of the poultry business in Saskatchewan, the Government in 1907 adopted an educational policy of a practical and commercial nature for promoting the poultry industry.

The fattening station was thought to be the best method of carrying out this policy, as the actual conduct of the work could be seen and would be a practical demonstration to each farmer with his own birds, of how to prepare them and how and where they might be marketed.

While the chief object of these stations was to educate by concrete demonstrations, they have also brought increased monetary returns to those who have placed their birds therein for fleshing. This latter result has added greatly to their popularity.

For the past four years the dairy branch of the department of Agriculture of Saskatchewan has conducted poultry fattening stations at several of the government operated creameries, and the writer, superintendent of Dairying, has demonstrated beyond doubt or question the existence of an almost unlimited demand for plump chickens, well fleshed and attractively prepared and packed. He has shown also that Saskatchewan farm-raised birds can be profitably fitted to meet this demand.

The tabulated statement given below presents a summary of the work done at the fattening stations:

(4.86 Canadian dollars - £ 1).

Year	No. of Birds	Live Weight before fattening	Dressed Weight	Value Dressed	Fattening cost per lb. dressed weight	Selling price: per lb. dressed weight
		lb	lb	$	$	$
1907	494	1 530	1 930	374.03	0.0588	0.1938
1908	1 861	6 231	6 920	1 243.52	0.0536	0,1797
1909	2 984	11 074	10 820	1 909.72	0.0602	0.1765
1910	1 333	4 705	5 094	1 016 25	0 0668	0.1995
Totals and averages.		23 540	24 764	4 543 52	0.0598	0.1874

The fattening cost includes the labour for feeding and plucking and also the cases in which the birds were packed for shipping. It was difficult to secure the right kind of feed and some of it cost as high as $2.50 per hundredweight (11 *s*. 6 *d* per Imperial cwt.). For the four years the average dressed weight per bird was 3.23 pounds and the average selling price 60.53 c. per chicken.

A large percentage of the birds was of a very poor type for feeding and on the whole did not make creditable gains. In all instances, however, the quality of the flesh was so much superior to that of the ordinary bird offered to the trade that wherever a sample case was sent to the dealer the quality and appearance of the birds brought business.

WILSON, W. A. **Fleshing Chickens for Market in Canada.** *Dept. of Agric. Saskatchewan, Canada: Bulletin*, No. 25, pp. 1-32. Regina, Sask., 1911. **589**

The most desirable poultry breeds for table trade, are the commonly called American and English utility breeds.

Both classes are classified below.

Canada

American Class.

Breeds	Varieties
Plymouth Rocks	Barred
	White
	Buff
Wyandottes	Silver
	Golden
	White
	Buff
	Black
	Partridge
	Silver Pencilled
	Columbian
Javas	Black
	Mottled
Dominiques	Rose Comb
Rhode Island Reds	Single Comb
	Rose Comb
Buckeyes	Pea Comb

English Class.

Breeds	Varieties
Dorkings	White
	Silver Gray
	Coloured

Redcaps	**Rose Comb**
Orpingtons	**Buff** **Black** **White**

The choice should be fixed on one of the common breeds such as Barred Rock, White Wyandotte, Buff Orpington or Rhode Island Reds.

A bird that will put on the most flesh for the least money in the shortest time must have short back, short neck, plump, well rounded breast and not be leggy; it should show every sign of a healthy, vigorous constitution.

During the breeding season birds showing the best conformation should be separated from the rest of the flock and subsequently placed on the egg and egg record. The stock produced from such eggs can be followed from year to year and the selection continued. An astonishing improvement in the build and conformation of the birds is quite possible within a short time.

The writer makes the following recommendations to poultry fatteners.

Birds of the utility breeds which are easily fattened and are in demand by the general trade should weigh from 3 to 3 ½ pounds when put into the feeding crate

The egg-laying breeds are not suitable for fattening. Be careful not to overfeed chickens the first week. Feed lightly and remove any feed left in the trough half an hour after feeding. Keep the troughs clean and sweet

After the first week give chickens all they will eat, regularly twice a day.

The oats or mast must be ground very fine. Oats ground for horse feed are not suitable.

Feeding skim milk or buttermilk whitens the flesh, which is desirable.

Put a little salt in the feed.

Give water in the trough twice a day.

Give some form of grit twice a week. Sifted gravel will do. Feed tallow during the last ten days; begin with one pound per day to 70 or 100 chickens and increase to one pound to 50 or 70 chickens. To prepare tallow: weigh quantity required for three days, melt it, and thicken, while hot, with ground oats. Mix one-sixth of this paste with the morning, and one sixth with the evening feed.

If a chicken gets off its feed remove it from the fattening pen for a few days, allowing it to run free.

Do not allow birds any food for 36 hours before killing. Kill chickens by dislocating the neck and use care so that no outside blemish is made. Market birds with heads and feet on. Dry, pluck at once, while the bird is warm. Observe the buyer's wishes as to whether the bird should be stripped of all feathers or a rim left on the first wing and leg points.

Leave about two inches of feathers around the neck. As soon as plucked, place the chicken in the shaping board to give it a compact, square appearance.

Chickens should not be drawn.

When cold, wrap in clean parchment paper, and pack tightly in shipping case to prevent injury by knocking about.

See that chickens, paper and cases are kept perfectly clean.

SWEERS, P. **Incubating**. (Ueber künstliche Brut). — *Deutsche landwirtschaftliche Geflügelzeitung*, 15. Jahrgang, Nr. 16, pp. 203-204. Berlin, 19. Januar 1912. **540**

Germany

Artificial incubation, when carried out wholesale, in most cases hatches less than 50 % of chicks from the eggs. This should form an encouragement for the improvement of the apparatus. When eggs die in the incubator it is always a sign of some defect in the incubating process. Unfertilised eggs carry no living germ, and therefore do not develop and likewise cannot die.

The Author says that according to his experiments an incubating temperature of 39.5° C. is sufficient, and that temperatures fluctuating from 1 to 2° C. for some hours cause no injury.

The incubator may be protected against cooling by being lagged with linoleum. A very important point is that there should not be large interstices between the eggs. They are best placed on a sack in the frame of the incubator during the first 18 days. There should likewise not be much air above the eggs ; in this way the natural conditions as with the hen are best reproduced. For airing 30 minutes per day suffice. From the 18th day, but not earlier, aeration should be increased, because the air then gets too moist owing to the moisture from the chipped eggs.

WARREN, MRS. H. F. **Making a Good Duck Record.** — *American Agriculturist*, Vol. 89, No. 1, p. 17. Springfield, New York, January 6, 1912. **541**

United States

For duck breeding the Author has arranged small gardens with a little house in each garden. The duck houses are often cleaned out. The litter used is sawdust as soon as the ducklings are over three weeks old.

Up to the fourth day of life the ducklings are fed with equal parts of wheat meal and bran; 5 % of sand and grit is added and the whole stirred up with warm water. From the fourth day onward about 10 % of beef and about 30 % of green fodder (fine-cut grass or salad) is mixed with the food. The ducks receive this food up to the age of five to six weeks; from that time the birds intended for killing are fed more plentifully. There are two feeding times a day until the age of two weeks, and later three feeding times. The chief essential is pure fresh food; souring the food is extremely injurious to young ducks. Water for swimming is not necessary, but the ducks should be able to dip their heads in the drinking trough; this is required for the purpose of cleaning the eyes and nostrils. The financial results of duck breeding conducted in this way are, according to the Author, very satisfactory; in the course of last year with 16 Peking Ducks she obtained a gross return of $ 114.20 for hatching and market eggs, and for breeding and killing ducks.

542 POPPE, Dr. and POLENSKE, Dr. **Does Feeding Antimony to Geese Produce Fatty Liver?** (Erzeugt die Verfütterung von Spiessglanz bei Gänsen Fettleber?). — *Deutsche Landwirtschaftliche Presse*, 39. Jahrgang, Nr. 7, p. 68. Berlin, 24. Januar 1912.

Germany

The view is widely held that by the daily administration of a pinch of antimony (*stibium sulfuratum*) to fatting geese a peculiarly big liver could be produced. The antimony is usually mixed with the moistened food.

The Authors endeavoured to verify the correctness of this opinion and at the same time to ascertain whether, when substances containing antimony or arsenic are fed to geese, traces of these minerals can be detected in the livers of the birds. For their experiments seven geese were used; three of them served only as controls, 1-2 grammes made up partly of chemically pure antimony sulphide and partly of ordinary antimony, were administered per goose per day. The condition of the birds was not in the least disturbed.

No action of the antimony on the size and weight of the liver could be detected. Chemical examination of the livers proved however that they had absorbed small quantities of antimony and arsenic. The quantities varied in the different livers, and appear to be influenced by the individuality of the bird. The Authors lay stress on the fact that the investigations were carried out with a paucity of material.

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FRATEUR, J. L. **Study in Ostrich Breeding** (1). (Etude zootechnique sur l'Autruche). — *Bulletin Agricole du Congo Belge*, Vol. II, No. 4, pp. 678-692. Bruxelles, 1911.

Union of South Africa

In the territories of the South African Union the exportation of ostriches and their eggs is only permitted to neighbouring colonies having a legislation identical with the laws in force in the South African Union, namely Southern Rhodesia and German South-West Africa. For export to North-West Rhodesia a duty of £1 per bird must be paid, while the exportation of eggs is prohibited.

There are two methods of ostrich farming practised

1. The older, pastoral breeding is carried on in the veldt on ranches of about 2 500 acres surrounded by fences; it is simple and the birds are very resistant to disease, but they are very difficult to keep under observation. On the average an area of 20 acres supplies sufficient spontaneous vegetation for the complete feeding of a bird. With the object of improving the pasturage, a number of head of cattle are likewise turned out.

2. The second method, intensive breeding, has been greatly developed of late years in consequence of the energetic construction of artesian wells and dykes, damming the valleys or rivers. The water obtained is used for irrigating the lucerne fields, which provide an excellent food for the ostrich. In grazing on lucerne these birds ruin it to such an extent that only 2 to 3 head per acre can be fed. For this reason the ostriches are often put in enclosures on the desert soil where they are fed with mown lucerne. On this system, 6 to 7 head per acre can be maintained, but the necessary labour is not always available.

Improvement of the quality of feathers will in the future be the main task of breeders, because, in the event of the prices of feathers declining, the ordinary quality would no longer pay expenses.

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(1) For the first part of this article, see *B*. Nov.-Dec. 1911, No. 3195. (*Ed.*).

To achieve this improvement and put the sale of feathers on a solid basis, a Congress of breeders has just asked the Government to prohibit the breeding of ostriches of inferior quality. We may add that the value of the feathers exported from South Africa has increased as follows from 1846 to 1909:

United States

1846	Fr.	200 000	£	7 920	14s
1871	»	3 994 225	»	158 187	2s
1896	»	12 988 475	»	514 395	0s
1909	»	52 452 125	»	2 077 311	16s

In the United States Florida, California and especially in Arizona, extensive ostrich breeding farms are found, aggregating about 7000 head. Arizona above all is perfectly adapted for this breeding, thanks to its dry climate, a necessary condition for the production of good feathers.

In those parts the cultivation of lucerne is secured by irrigation. In the valley of the Salt River the construction of the Roosevelt dam has just been completed, its artificial lake reservoir having an area of 6 600 hectares (16 300 acres) and containing enough water to irrigate 100 000 hectares of desert (247 000 acres). The water consumers of the Salt River Valley have formed a Company which will in ten instalments repay the total cost of the dam to the Government, which has advanced it without interest.

In the United States, every endeavour is being made to improve production, and probably these efforts will in the future be successful, given the necessary factors. The annual return of an American ostrich is fr. 150 (nearly £6). Verminous diseases, which are very injurious to the young birds, are unknown in America. Home production is protected by an import duty of 20 % on raw feathers.

Argentina

In Argentina, there were in 1897 about 13 000 ostriches. The exportation of feathers is inconsiderable and the prices are low.

Egypt

Egypt exports ostrich feathers annually to a value ranging from fr. 6 000 000 to fr. 10 000 000 (nearly £ 240 000 to £400 000). In 1875 the value of its exports was greater than that of Cape Colony exports. Only one large ostrich farm exists, near Cairo, the principal market for the feathers. In the Sudan, the natives possess

Sudan

domesticated ostriches. Breeding methods are exceedingly primitive. The greater portion of the feathers exported by Egypt come from wild ostriches.

Algeria

In Algeria, endeavours have been made to domesticate the ostrich, but without great success. The wild ostrich has also disappeared.

Morocco

Morocco formerly supplied wild ostrich feathers, but the exports have ceased.

Tunis
Tripoli

From Tunis and Tripoli some quantity of wild feathers is exported.

German East Africa
German S. W. Africa

In German East Africa and German South-West Africa there are regions which are quite suitable for ostrich breeding. During late years this breeding has undergone great extension there.

Madagascar

In Madagascar, there are several hundred ostriches. The interior of the Island supplies feathers of greater value than the Coast.

Australia

In Australia the Zoological and Acclimatisation Society of Victoria in 1870 made the first attempt to acclimatise African Ostriches. The results were not encouraging, but nevertheless breeding farms were established in several places. As lucerne does not thrive in Australia, the ostrich is fed on clover, turnips, cabbages, swedes, etc. Australian feathers are of a rather inferior quality ; South Australia alone produces a better quality.

As the production is not nearly sufficient for the country, a large quantity of feathers is imported and pays a duty of 15 per cent on the gross price.

France
Germany

In Europe there is an ostrich breeding farm near Nice, and the establishment of Karl Hagenbeck at Stellingen-Hamburg likewise breeds ostriches for feather production. Good results appear to be obtained.

COLLINGE, WALTER E. **Coccidiosis in Fowls and Game Birds.** — *Second Report on Economic Biology*, pp. 50-53. Birmingham, 1912. **544**

A number of cases of *Coccidiosis* in fowls and game birds have been enquired into.

Great Britain

It is a disease which seems to be on the increase in this country, and is due to a parasite which belongs to the group of Protozoa known as *Coccidia*, which destroys the mucous membrane of the intestine, setting up enteritis and diarrhoea. The disease usually has a fatal effect upon the host.

The particular species found in the body of the fowl is known as *Eimeria* (*Coccidium*) *avium*.

The birds, when early infected, stand about, droop their wings and utter plaintive cries. They eat and drink far more than healthy birds, but, nevertheless, become thinner, the muscles of the breast and legs showing this to a marked degree. The loss of weight is remarkable.

The infected birds also become markedly anaemic, the comb, wattles and cere becoming pale and bloodless.

The feathering also is very weak compared with that of healthy birds; that of the legs is ragged, the quills are less rigid, the sheen on the feathers is less developed, and the replacement of nestling down by ordinary feathers is much retarded in diseased birds.

Owing to the attack of the parasite on the mucous membrane of the alimentary canal, digestive troubles occur.

Death from *coccidiosis* is often sudden; the corpses of all birds dying from the disease should be burnt, for the cysts, which are the resistant forms of the parasite, remain infective for long periods, even for a year or more, long after the disintegration of the body of the first host.

Dissemination of the Disease.

The malady spreads with remarkable rapidity. The faeces are the chief source of contamination, and as these dry, they are distributed by the wind in the form of dust, which contains the parasites in various stages of development.

The parasites are taken into the body of the fowl by the fouling of food and drinking water.

Rain is an important factor in dispersing the dejecta of infected birds.

A small dipterous fly, *Scatophaga stercoraria* Linn., lays its eggs in these droppings and the larvae develop there. Such larvae and flies were found to contain in their intestines and dejecta the oocysts of the parasite.

Preventive and Remedial Measures.

1) All dead bodies and infected droppings should be burnt; and where an outbreak occurs among a small number of birds, the best plan is to destroy the lot.

2) The ground should be treated with a liberal application of ground *unslaked* lime, and this should be allowed to lie on the surface for a few days before being turned in.

3) The same land should not be used as a run for at least a year.

4) A thorough cleansing of pens, perches etc. should be given, and all well lime-washed before being used again

5) Eggs, before being set for hatching, should be carefully wiped over with 90 per cent alcohol, or strong methylated spirit, and then dried.

Various drugs have been tried, such as ferrous sulphate, sodium salicylate, catechu.

The last remedy has been used with success on several large poultry runs where heavy mortality through *coccidiosis* had occurred in previous years.

Ferrous sulphate, 10 grains in one gallon of drinking water (and also a much stronger solution) gave very encouraging results; indeed anything that will help to raise the general vitality of the birds, will probably aid in resisting the action of the parasite.

BEES.

Elimination of the Swarming Instinct. (A Novel Suggestion). — *The Canadian Bee Journal*, Vol. 20, No. 1, p. 7. Brantford, January 1912. **545**

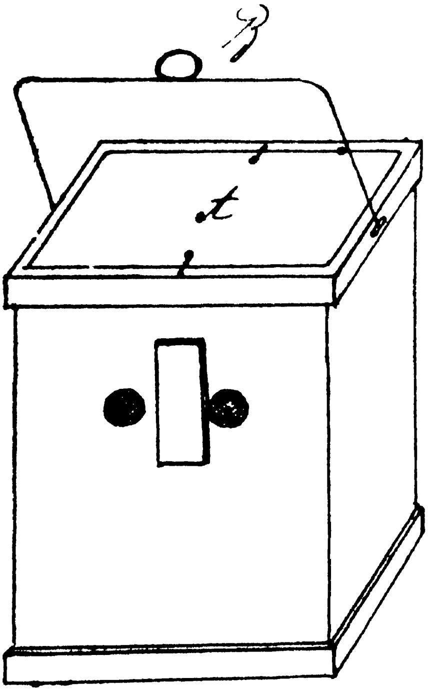
Canada

Everybody nowadays is interested in the matter of the " elimination of the swarming instinct " and many are convinced as to its practicability. An interesting and a novel suggestion is made by a recent writer to the effect that " the No. 1 gland system of the worker " plays a prominent part in the " mechanism which controls swarming ". The writer proceeds to state that an excess of the secretion gives rise to the construction of queen cells and the desire to swarm. A contracted brood nest acts therefore by limiting the opportunity for its use. On the other hand, the removal of sealed brood gives extra scope to the queen and to the nurse bees.

KELLER, AD. **Box for taking Swarms.** (Mein Schwarmkasten). — *Deutscher Imker aus Böhmen*, 25. Jahrgang, No. 1, pp. 12-13. Prag, Januar 1912. **546**

Austria

Figure I shows a Swarm Box made of board 3/4 cm. (1/3 inch.) thick for Gerstung's Apiaries. The box comprises 7 Gerstung whole frames, and can be closed above and below by a board A, which is in each case secured by 2 catches. A wire hook B is fitted above, by which the box is carried. Ventilation is provided for by two holes on two sides opposite the honeycomb spaces, closed inside by means of wire gauze and outside by a pivoting board. The 7 frames are first covered over with a wax cloth and afterwards with two lid plates (Fig. II: *a*, *b*, and Fig. III) provided with a sort of channel outside in which the frames hang. Finally the board A is placed on top. If a swarm is to be got into the box, the latter is suspended by the wire hook, if possible in such a way that its bottom opening is directly over the swarm, and the box itself just touching the swarm. The Bees will then enter of their own accord. When this is done, the handle permits of taking all seven frames with the Bees out of the box and hanging them in a Gerstung's hive by means of the plates.



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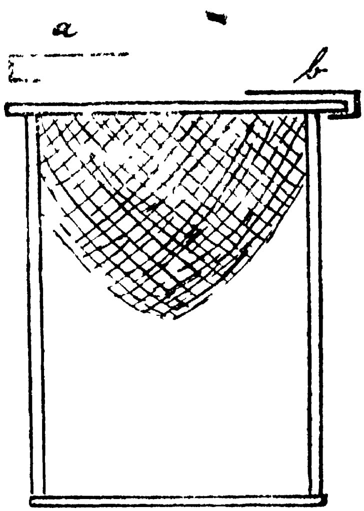

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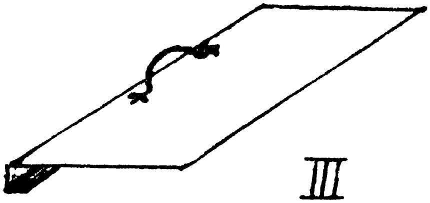

III

SILKWORMS.

PAINI, CARLO; BARTEZAGHI, ENRICO; and HONDA, F. **Sericulture in Japan. Situation; Development; Government Initiative.** (La Sericoltura in Giappone. Situazione; Sviluppo; Iniziative del Governo). — *L'Industria Serica*, 1911, No. 51, pp. 2-3; No. 52, pp. 2-3. 1912, No. 1, pp. 2-3; No. 3, pp. 2-3; No. 4, pp. 2-3. Torino, Dicembre 1911, Gennaio 1912. 547

The prosperity of Japanese sericulture is due to Government initiative which may be traced to the Imperial Family.

Japan

In 1908 the Institutes of Sericulture at Tokyo and Kyoto delivered certificates to no less than 2 960 pupils. A third institute is to be opened at Hyeda. Besides these there are 8 smaller provincial institutes and 5 district ones, 4 provincial and 13 district schools. The Government grants subsidies for the increase of mulberry plantations, and encourages frequent exhibitions (at least 50 a year). In all parts of Japan instruction is given, and investigations are made, in the silk industry with great energy and diligence. 7.44 % of the entire cultivable area is devoted to mulberry trees.

The production of silk-worms' eggs is valued as follows:

1) " Cellular " *i.e.* obtained from selected parents, 88 740 558 clusters.

2) " Industrial ", 5 349 216 cards, each card containing the clusters laid by 100 moths.

The production of living cocoons in 1907 amounted to 285 million lbs., of which 185 million were from the spring brood, 39 million summer, and 61 million autumn.

The production of raw silk in 1907 amounted to over 19 million lbs., and of floss silk in the same year to nearly 4 ½ million.

The mulberry tree, except the Chinese variety Roso, is indigenous. *Morus alba* is the commonest.

The bush mulberries (Nogari jitale) are grown in meadows, and on all odd bits of land, road-sides, banks of ditches and of rivers, and borders of fields.

To facilitate silkworm breeding, early, intermediate, and late mulberries are planted in the proportion of 20, 30 and 50 %, respectively. A mulberry plantation lasts from 10 to 20 years, after which it must be renewed elsewhere.

Dwarf mulberry trees are grown in the districts of Gumma, Tokyo, and Fukushima. The high mulberry trees — *Takagari-jitale* and *Kyoboku-jitale* — are much grown at Gumma and Jumanashi. The soil is manured thrice a year, chiefly with slow-acting nitrogenous fertilisers.

Generally each small grower prepares the eggs for himself. At Tokyo they are beginning the practice of hibernation with refrigerators.

The white annual race, rather small, with elongated cocoons, is that which chiefly prevails. The double-moulting race tends to disappear. At the Institutes of Tokyo and Kyoto researches are being carried out on selection and crossing to obtain new races.

There are three broods in the year: spring, representing from 60 to 65 % of the whole; summer, 10 to 20 %, and autumn, 20-25 %.

The summer brood is decreasing, while that of the autumn tends to increase. The best quality is obtained from the spring brood.

The silkworms are generally kept very crowded. Great care is taken, but the management is not superior to that in North Italy.

Special buildings for schools and model silkworm nurseries have been constructed.

To combat the diseases of silkworms the Government has established 132 offices, employing 3 175 people. In spite of this the worms suffer much from "pébrine", silkworm rot and "uji" (crossocosmia).

The annual production of cocoons amounts to 352 million lbs. at the present time, the average increase every year being about 22 million. The cocoon markets are held in the evening until midnight.

The cocoons are dried according to the systems of Takwan and Makabara. The old systems of reeling are called "Te-guri" and "Za-guri". The industrial reeling in European fashion is done as in Italy but the spinning-machines have no beaters.

All the silk has to be unwound again after the reeling, owing to the damp climate which makes the threads stick at first. The spindle for re-reeling measures in diameter 54 cm. (21.3 in.) and in length 57 cm. (22.4 in.).

FISH.

548 **Haas, Dr. Carp Ponds Adjoining Slaughter Houses.** (Der Karpfenteich am Schlachthof). — *Allgemeine Fischerei-Zeitung*, 37. Jahrgang, Nr. 3, pp. 68-69. München, 1. Februar 1912.

Germany

In the vicinity of the Offenburg slaughter house a carp pond was prepared in 1911 with a view to making use of slaughter-house offal. On the 12th May the pond was stocked with about 200 dappled carp two years old, averaging a weight of 250 to 374 grammes (8.8 to 13.2 oz.). In addition 80 tench were put in. For feeding, a mixture of blood, rye meal and a small proportion of boiled meat was used. The fish were fed 1-3 times a day according to the weather. They always ate the food greedily.

On the 12th October 1911 the pond was emptied of fish. About 286.5 kg. (630 lb) of carp and 2.5 kg. (5.5 lb.) of tench were saleable; 60 tench were put into a winter pond. The average gain in weight per carp was 1.250 kg. (2.75 lb.). The total proceeds obtained for the fish were M. 411.25 (£20.2*s* 9*d*); the expenditure of fish and rye meal amounted to M. 192.65 (£9.8*s* 6*d*) leaving a profit of M. 218.60 (£ 10.14*s*). The work was carried out by the existing staff without extra expense being involved. The blood and meat offal was supplied free of charge by the slaughter-house.

The carp were of excellent quality, so that fish breeding on this method is in every way to be recommended.

549 **Colb. The New Bavarian Law on Water Inspection and its Value from the Point of View of Fishing.** (Uber den Wert der Wasserschauen nach dem neuen Bayerischen Wassergesetz für die Fischerei interessenten). — *Allgemeine Fischerei-Zeitung*, 37. Jahrgang, No. 2, pp. 45. München, 10. Januar 1912.

Germany

In Article 201 of the new Bavarian law in relation to waters. periodical inspections of water by specialists are provided for. The date of these inspections is published from time to time in the Official Gazette.

The water inspection covers the entire condition of the river and the installations of every description erected on or along it.

It will further determine whether the conditions subject to which the emptying of refuse water is allowed have been complied with, and whether hydraulic installations have been unlawfully erected or modified.

Complaints may be made verbally to the Water Inspection Commission by those concerned, and will then be examined into on the spot.

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS.

550 CASTELLI, M. **Novelties of the Year in Agricultural Mechanics.** (Novità dell'annata nel campo della meccanica agraria). — *L'Italia Agricola, Almanacco per l'anno 1912*, pp. 128-137. Piacenza, 1911.

Italy

Mr Castelli limits himself to noting those inventions of the year which concern the tillage of the soil, and which may be considered absolutely new, and he excludes all the improved apparatus, already existing and known in Italy, however important. He therefore only alludes to the constantly increasing use of well-known economic apparatus, with cable traction, like the Violati-Tescari, the Casali, and the Santachiara — machines which have been slightly modified and improved since last year. He devotes more space to the *Barford-Perkins* apparatus, which may be said to have established itself this year in the Roman Campagna (Palidoro).

This apparatus is more powerful and more complete than the preceding types. It is worked by a single engine, and for the pulleys adjustable by hand, which often cause serious difficulties in anchorage, anchor-trucks with automatic adjustment have been substituted. The windlass, on a four-wheeled truck, is worked by the engine by means of a chain. The connecting and disconnecting each of the drums can be done without stopping the motor. The use of a chain has made it possible to employ drums of large diameter, (about 1 metre, or 5 ft. 3 in.; each capable of holding 800 metres, or 2600 ft., of cable of 15 mm. or 0.59 in.) and consequently cables consisting of a few thick strands; so that breakage by friction and rusting is less frequent. For working the apparatus five operators are required. This includes the transport of water for the motor. With a double share for deep ploughing the area ploughed over practically amounts to about two hectares (5 acres) a day, requiring, according to the nature of the soil, an engine of from 10 to 15 nominal H. P

The writer then passes to traction steam ploughing, and after having mentioned the American tractor *Avery*, which has proved very satisfactory in the Roman Campagna, he describes a new type of steam tractor, suitable for medium-sized farms, where the fields are not very large, and the soil not too compact.

This tractor, constructed by Messrs Mc. Laren — a firm well known in the Piacentino for their powerful ploughing engines of 10 tons and more, gave excellent results when it was submitted to public trials last September on the Estate of the Bonafous Institute, near Turin. These trials, the results of which will be published in the report of the Minister of Agriculture on the competition in which this machine took part, have shown once more the practical importance of superheated steam on the consumption of fuel and water.

Also the multiple ploughs presented by the same firm were admired for the strength of the frame-work, and for the simplicity of the connection of the steering gear and of the automatic apparatus far raising the plough. (Ploughs with three shares that can be coupled for uneven land; with four shares, with or without subsoiling apparatus; and with six shares).

The *Tolotti-Pavesi* and the *Patuzzo* are two ploughing machines, with benzine motor, of an entirely new type, and constructed in Italy with remarkable originality of conception. From the technical standpoint they have given excellent results as regards the work done; while their economic advantage can only be discussed in each individual case.

The *Tolotti-Pavesi* is a three-wheeled automotor truck, to which the plough is rigidly fastened. The front wheel with steering gear is provided with a cutting disc; of the two back wheels, the right one is a motor, and its axle is fixed as regards the frame-work; while the left one simply carries, and equally with the steering wheel, it can be raised or lowered, by using the energy of the motor for the vertical adjustments.

The driver can therefore, from his seat, by simply working two levers, put the frame-work on a level, regulate the depth of the ploughing, and raise the working part of the machine.

Another characteristic of this apparatus is the motor wheel. It is placed so as to pass along the bottom of the furrow made by the plough, and provided with moveable blades, so as to obtain the necessary hold on the ground with little weight, and without excessive waste of energy.

The trial type of this plough weighs 950 kg. (2 100 lbs.) and has a benzine motor of 10 H. P.; the three shares work over a width of 0.70 metres (27.5 inches), at a depth that may be changed at will up to 20 cm. (8 inches); and it is obvious that the construction of lighter types would not be desirable, but that if the power of the motor were increased, and, in consequence, the speed (it is 0.90 m. or 3 ft. at present), the economic conditions of working it would also be somewhat improved.

The *Patuzzo* apparatus consists of an automotor truck, with plough attached, which is hauled by a cable stretched along the furrow and fastened at the ends. Instead of the single endless cable, or chain, as in the other types now given up, there are two cables partly wound on two drums which are carried by the apparatus, and each of which is fastened at one end of the furrow to be ploughed over

This apparatus has the following advantages over the double windlass system with opposite anchor-trucks, or the simple return pulley it avoids all dragging of the rope, and the consequent wear and tear and resistance ; it allows a higher mean speed, and avoids the need of slowing down, signalling etc. ; it requires for the same length of furrow less cable ; anchorage is not so difficult ; it is more suited for fields with trees ; and it costs less.

It is superior to the system with two opposite windlasses in the following points the dragging of the rope is avoided ; the plant costs less, and less hands are required ; the motor is utilised better, as the machine does full work both going and returning.

Both systems have the drawback of greater weight to be dragged along the furrows, and of the greater exposure of the motor and its connections to the action of dust.

Compared with the systems of direct traction, and those with no artificial arrangement for gripping the ground, the auto-towing system offers, or might offer, all the advantages that belong to lightness ; for weight is not at all required for obtaining grip. The question of weight however does not seem to have been sufficiently considered. In fact in this case the weight supported by the wheels, not counting the working part of the machine, is about 12 qls. (2 640 lbs.) that is, 120 to 150 kg. (264 to 330 lbs.) per H.P. (Motor of 8 to 10 H.P.), — not at all less than the weight of the direct tractors.

The mistake lies in having adopted too slow a speed (about 0.85 to 0.60 m., 2.8 to 2.0 ft., per sec.) with the consequent want of proportion between the power of the motor, the weight of the apparatus, and the ploughing section.

The electric ploughing apparatus from the firm of Siemens-Schuckert, on view at the Turin Exhibition, is also worth mentioning. It is well designed, specially as regards the electric part, and it is the first powerful two machine apparatus made in Italy for utilising the energy supplied by central hydro-electric stations, and transported by high tension current.

In competing with the steam ploughing apparatus with two machines, it is composed of two motor-windlass cars, two transformation cars, two moveable cables, apparatus for the high potential current, and the ploughing gear.

The windlass-car, whose outside dimensions are 22×8.5×10 ft. (height), carries a three-phase motor of 60 kilowatts, the manipulation, control, safety, and resistance apparatus, the cable, the transmission-shafts, and the drum with horizontal shaft parallel to the carrying shafts, and capable of winding 500 metres (550 yards) of cable.

The transmission from the motor to the first counter-shaft is by a belt; thence to the second counter-shaft with change of velocity, and from the second to the drum, it is by cog-wheels.

The two normal speeds transmitted to the plough are 0.90 m. (3 ft.) and 1.60 m. (5.3 ft.) per second. Those transmitted to the back wheels, for moving the truck, are 0.24 m. (0.8 ft.) and 0.40 m. (1.3 ft.). By changing the pulleys on the motor, it is possible to obtain a speed of from 1.30 to 2.10 m. (4.3 to 7 ft.) per second for the traction cable, and from 0.33 to 0.50 m. (1.1 to 1.7 ft.) for the truck. The motor itself is fixed to a carriage running on guides; an automatic interrupter protects the motor from abnormal obstacles (stones, roots etc.); while to prevent mistakes in management, the moveable cable cannot be connected except when the interrupter is open, nor disconnected except when the current is off

The transformation cars are used to reduce the tension of the main line from several thousand volts (5000 to 15 000) to 500 to 1000. The truck for 10 000 volts and 70 kilowatts weighs three tons.

551 **Lister Drill and Lister Cultivator.** — See above, No. 490.

552 CONDÉ, F. DE. **Trials of Jerusalem Artichoke Diggers at Montmorillon.** (Les Arracheurs de Topinambours aux essais de Montmorillon). — *Journal d'Agriculture pratique*, 76e Année, T. I, No. 2, pp. 57-58. Paris, 11 Janvier 1912.

France

The labour required for digging Jerusalem artichokes by hand is becoming more and more rare in the Department of Vienne, and the Poitevine Society for the Encouragement of Agriculture has just organised trials of mechanical diggers at Montmorillon. These trials took place on Dec. 24th 1911 in a loam soil which represents the average type of that district.

Ten machines, which can be divided into three categories, took part in the trials

1) Machines like potato-ploughs; these are the most simple; the machine is set in at the end of the ridge, and the tubers are thrown to the sides; two handles are used for steering. Three such machines were shown.

2) Machines with rotatory forks The digger, which has two wheels, carries at the back a disc (or a star) at right angles to the direction of progress, this disc has forks round it and has a rotatory movement; in front of the forks, a share cuts through the earth below the tubers; the forks in succession, throw up the earth, so that the tubers fall to the side of the machine. In some of the machines the tubers are thrown against a wire-screen to free them from the soil.

These different machines possess, according to their constructors, a seat, handles, levers to regulate the depth, etc. Six of this kind were shown.

3) A digger with a fore-carriage consisting of a share with openwork mould-board, behind which is an axis furnished with projecting pins; this revolves rapidly and breaks up the soil raised by the share, throwing the tubers to one side.

All the machines worked well.

The advantage of the potato-plough type of digger is its low cost, simplicity and strength.

The cheapness and strength of the machine are important matters, seeing that the artichokes are only dug up in small quantities, either every day, or every two days according as they are required. (The tubers keep well exposed in the field, and can withstand temperatures of — 16° C. and — 18° C., *i.e.* 29 to 32° F. of frost).

The machines with revolving forks are most efficacious, but their high price makes them inaccessible to many growers.

The varieties which answer best with diggers are those in which the tubers grow in clumps at the base of the stalk.

Thus the red kind of Jerusalem artichoke is to be preferred to the yellow.

GÜNTHART, ALOIS. **Canvas Hose for the Conveyance of Liquid Manure.** (Der Segeltuchschlauch als Transpordmittel flüssiger Dünger). — *Wiener Landwirtschaftliche Zeitung*, 62. Jahrgang, Nr. 5, p. 47. Wien, 12. Januar 1912. **558**

Germany: Bavaria

For several years, in Allgau in Bavaria, canvas hose of about 8 cm. (3.2 inches) diameter has been used to convey liquid manure to the fields. The several sections of hose should not exceed 8 m. (26 feet) in length. They are suitably connected up by means of a bayonet joint which can be readily detached. The hose is impregnated with antiseptic substances by the manufacturer and lasts 4 years, if, each time after use, it is washed and then hung up in a dry room. The price, together with joints, amounts to about fr. 0.80 per metre run (about 2 ½ *d* per lineal foot). The use of the hose will only present advantages where the land to be manured is not too far from the manure tank; there should also be a natural slope available. If this is wanting, the deficiency may be made good by pumping the manure into a higher tank and running it into the field from there. (1)

The hose is used as follows: The liquid manure is run out of the tank into a trough, fitted with an outflow pipe and cock. This pipe must be about 25 cm. (10 inches) above the bottom of the trough, to enable sand and mud to settle and avoid getting it into the hose. A sufficient number of lengths of hose are connected together to reach from the trough to the farthest end of the land to be manured. A workman at the end of the hose waters a strip of about 10 m. (about 33 feet) with the liquid; after sufficiently manuring a piece of land, he detaches one hose length after the other, allowing it to lie on the ground for the moment, and continues manuring through the shortened hose. In this way the end of the plot of land lying nearest the tank is reached and the whole strip 10 metres wide will have been watered.

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(1) In Switzerland an electrically driven centrifugal pump has been successfully used in direct combination with canvas hose, for conveying liquid manure. The elevated tank is then unnecessary. (*Ed.*).

The cock is now shut off, the lengths of hose connected up again, and then a fresh strip manured as above.

The hose may also be advantageously used in conjunction with the manure cart for pieces of land which are very steep. The cart remains at an elevated point of the land, the hose is fastened to the spigot of the barrel containing the manure, and the latter then distributed in the way above described.

The advantages of this method are:

1. Rapid work.
2. Teams are not needed.
3. The distribution of the manure is the best imaginable, especially if water is added.
4. In rainy weather the greensward is not injured by carts and draft animals.

554 RINGELMANN, MAX. **Motor Vans.** (Camions automobiles). — *Journal d'Agriculture pratique*, 76e Année, Tome I, No. 3, pp. 86-87. Paris, 18 Janvier 1912.

France

The Minister of War organised at Versailles from July 18 to Aug. 11, 1911, a trial competition of motor vans.

There were two classes: the motor vans properly so called, and the traction engines.

1. *The Motor Vans.* — The conditions were:

Maximum weight empty	7 150 lbs.
Maximum load per axle	8 860 »
Ratio of the load to the total weight, at least	45 %
Mean speed, per hour	7 5 miles
Maximum speed, per hour	15.5 »
Minimum speed, on an incline of 12 %, per hour	2.5 »

The vans both loaded and unloaded were required to move in a regular line at an average speed of 7 ½ miles per hour.

At the following base prices:

Oil	2*s* 2 ½*d*	per	gal.
Grease.	4 ¼*d*	»	lb
Distillate	1*s* 3*d*	»	gal.
Benzol	10*d*	»	»
Carburetted Alcohol	1*s* 4 ½*d*	»	»

the mean cost of combustible, oil and grease per ton of useful load per mile might not exceed 1 24 *d* for rubber-tyred vehicles, or 1.56 *d* for others.

The course was arranged on roads radiating from Versailles, and totalled 1 570 miles; the daily stages were from 51 to 67 miles.

On the first nine stages the engines were to use distillate, on the next four carburetted alcohol, and on the last nine benzol.

Four stages were made without a load.

For the 38 vans submitted to the trial the price per load-ton per mile varied from 0.45 *d* to 0.98 *d*.

The following table gives the details of those machines only in which this figure was below 0 54 *d*. To these prices should be added the hauffeur's wages, and the fixed rates for amortisement, interest and upkeep of the machine.

Vehicle —	Weight of empty vehicle tons	Load tons	Weight on rear axle tons	Cost	
				per mile-vehicle pence	per load-ton per mile pence
De Dion-Bouton	3 06	3 42	4 30	1.54	0.45
» »	3 03	3.45	4 21	1.62	0 47
Desmarais and Morane .	2.53	2.35	3.50	1.13	0.48
Peugeot	2.76	2 30	3 46	1.13	0.48
Desmarais and Morane .	2.53	2.37	3 54	1.18	0.50
» » . .	2.30	2.11	3 19	1.08	0.51
Clément-Bayard	2.64	2 51	3 54	1.36	0.53
» »	2.59	2.50	3.45	1.39	0.54

2. *The Traction Engines.* — The conditions were.

Maximum weight empty.	12 320 lbs.
Maximum load per axle	11 000 »
Ratio of the load to total weight at least.	30 %

The engine, loaded so as to have a total maximum weight of 17 600 lbs. was required to draw a total weight of 15 400 lbs. The car weighed 4 400 lbs. and its load 11 000 lbs.

The vehicles were required to climb ascents of 8 % on wet or muddy roads, and 10 % on roads in good condition.

The mean speed of an engine loaded and drawing a total weight of 15 400 lbs. was to be at least 5 miles an hour.

Six traction-engines were submitted to all tests over a total course of 1 255 miles, and the cost of conveying one ton load the distance of one mile varied from 1.06 *d* to 2.61 *d*.

The following are the figures relating to two Saurer traction-engines:

	I	II
Weight of tractor empty	3 84 tons	3.82 tons
Load	2.95 »	2.95 »
Weight on hind axle	4.92 »	4 90 »
Cost per vehicle-mile	3.15 *d*	3 23 *d*
Cost per load-ton per mile . . .	1.06 *d*	1.09 *d*

Taking account of the fact that the load drawn was 11 000 lbs.; the price representing the transport of one ton for one mile for the whole load (carried and drawn) of 17 600 lbs. works out at 0.40 *d* for the first tractor and 0.41 *d* for the second.

Sixteen vans and three traction engines, all of them with oil motors, were awarded prizes, the steam machines, despite the favourable conditions accorded them, failed; and this failure is chiefly due to their limited fuel and water capacity.

BUILDING-CONSTRUCTION.

555 Hygienic Cow-Sheds and their Construction.

ROLET, ANTONIN. L'étable hygiénique. — *L'industrie laitière*, 37ᵉ Année, No. 2, pp. 17-21. Paris, 14 Janvier 1912.

RAINERI, LUIGI. Ricoveri per gli animali. — *L'Italia Agricola*, Anno XLIX, No. 1, pp. 11-14. Piacenza, 15 Gennaio 1912.

DE LINDE, PETER. Restoration of the Cement Art (Concrete Barn Floors). *The Missouri and Kansas Farmer*, Vol. XXVIII, No. 8, pp. 159-163. Kansas City, Dec. 15, 1911.

France. Italy. United States

The contents of these three articles are summarized under the 11 following headings.

1 *Site*. — Choose a dry well-drained spot, a little elevated, on a slope, and where a sufficient supply of pure water can be obtained.

Isolate the cow-shed from the other buildings, in order to avoid risks of fire, and infection of the milk in case of illness among the staff.

2. *Exposure.* In temperate districts, the chief frontage should face east or west, and in cold districts it should look south.

3. *Walls.* For reasons of cleanliness, the inner angles of the walls should be rounded; the walls themselves should be smooth to give no hold to dust, insects and microbes, and to prevent their impregnation with ammonium carbonate, which imparts its odour to the milk. The base of the walls should be cemented to a height of 1.75 metres (5 ft. 9 in.) from the ground.

The bottom of the doors and of the wood-work (except the partitions between the stalls if present) should receive a coat of impermeable paint in order to facilitate washing. To the remainder of the walls should be applied, as a spray, milk of lime with the addition of an antiseptic (bisulphite) (1); two applications a year are necessary, in order to kill pupae of insects.

4. *Floor.* A floor of simple trodden earth suits the animals well; but it is permeable, difficult to wash, and forms cavities.

Wood, macadam, Portland cement, asphalt, paving formed of round pebbles are not to be recommended.

The best materials are flags or stone bricks fixed edge-ways, pointed with cement or, for the sake of economy, laid flat on a layer of sand; a kind of hydraulic cement on a layer of broken stones, without interstices, or 8 cm. (3 in) of coarse concrete, covered by 5 cm. (2 in) of coke or asphalt (isolating) and the whole finished by a layer of cement. A slope of 1 to 1 ½ % is enough; a greater slope fatigues the animals. The urine channel should have a fall of 2 to 3 %, a width of 30-45 centimeters (12-18 in) and a depth of 5-10 cm. (2-4 in) according to the kind of form selected.

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(1) A solution of sulphate of copper may be added to the milk of lime, as its antiseptic action is more marked than that of the sulphur dioxide produced from bisulphites.

Sulphate of copper in ½ per cent solution kills the typhoid fever bacillus, at 2 per 1000 it destroys the cholera bacillus, and at 1 per 1000 it deodorizes and sterilizes sewage water.

On the contrary the fumes of burning sulphur (sulphurous anhydride) do not kill any spores and their effect upon bacilli is nil unless they are highly concentrated and their action is continued for 2 or 3 hours (Ugo Barpi *Abitazioni degli animali domestici*, Milano, 1897). (*Ed*) suspended by a cord which passes over a pulley fixed in the ceiling. Electricity can also be used with advantage.

"L'Italia Agricola" gives a description of a model cow-shed in the Province of Piacenza. The windows, one for every two cows, are of reinforced concrete. The roof projects far beyond the outer walls and affords a shelter for the hay waggons; it also protects the base of the shed from the sun. The article is illustrated by figures giving the elevation, and two sections, transverse and longitudinal, of the building, showing the details of its construction.

RURAL ECONOMICS.

556 **Data on the Rents that are now being paid for Land in Italy**. Raccolta dei canoni di affitto che sono pagati attualmente in Italia). — *Collected by the Bureau of Agricultural Intelligence and of Plant Diseases.*

Italy

The figures given below are quite recent, with the exception of those taken from the Parliamentary Enquiry into the conditions of the Peasantry in the South of Italy and in Sicily.

The taxes are always paid by the owner of the land, save in those cases especially mentioned.

PIEDMONT.

Province of Turin. Lands adapted to ordinary crops:

From 105 to 210 fr. per hectare (£1. 13*s* 7*d* to £3. 7*s* 2*d* per acre) according to the locality, exposure, nature of the soil and subsoil, and irrigation.

For land suitable for market gardens the rent is from 183 to 341 fr. per ha (£2. 18*s* 7*d* to £5. 9*s* 1*d* per acre).

Province of Novara, district of Vercelli. — For average sized farms on soil of medium fertility and provided with water the rent is about 250 fr. per ha. (£4 per acre).

On the best soils both for fertility and other favourable conditions, the rent is from 240 to 250 fr. per ha (£3. 16*s* 9*d* to £4 per acre) for large farms, whilst for medium sized and small ones it rises to 280 fr. (£4. 9*s* 7*d* per ac.). On poorer soil the average is about 200 fr. (£3. 4*s* per ac.).

Province of Cuneo. — The rent for lands of the various classes is as follows:

1.st class	180 to 260	fr. per ha	(£2. 17*s* 7*d* to £4. 3*s* 2*d* per acre).
2.nd »	140 to 180	» » »	(£2. 4*s* 9*d* to £2. 17*s* 7*d* » »)
3.rd »	100 to 140	» » »	(£1. 12*s* to £2. 4*s* 9*d* » »)
4.th »	80 to 100	» » »	(£1. 5*s* 7*d* to £1. 12*s* » »)

Province of Alessandria. — In the district of Alessandria the rents given below refer to arable lands and meadows in the plains, and to vineyards on the hills.

The lease is usually for vineyards and the rents are the following:

Alluvial soils in the Tanaro valley, 150 to 170 fr. per ha (£2. 8*s* to £2. 14*s* 5*d* per acre).

Heavy soils on the plateaux 130 to 140 fr. per ha (£2. 1*s* 7*d* to £2. 4*s* 9*d* per acre).

Gravelly soils of the Fraschea, or the plateau between the Orta, the Bormida and the Tanaro, about 120 fr. (38*s* 5*d* per acre).

Vineyards: either 160 to 170 fr. per ha (£2. 11*s* 2*d* to £ 2.14*s* 5*d* per acre) or the produce is divided between the owner and the farmer: two thirds of the grapes and one half of the other crops being taken by the farmer and the rest by the owner. This agreement, however, is really more a form of metayage, or working on shares, than renting.

LIGURIA.

In the plains of Sestri Ponente as far as Rapallo, and on the other side as far as Porto Maurizio, the rent paid for good irrigable land is from 400 to 600 fr. per ha (£6. 8*s* to £9. 12*s* per ac.).

On the low lands of the western Riviera the rent of farms suitable for market garden produce or early flowers rises to 1000 and 1200 fr. per ha (£16 to £19 .4*s* per ac.).

In the hills where the olive is cultivated, farms having some level grass-land, a certain extent of wood and a house, let for 200 to ,00 fr. per ha (£3. 4*s* to £4. 16*s* per ac.).

Very often these peasant farmers pay high rents for farms situated near factories, in which the able bodied members of their families find employment, while the women and the less robust attend to the cultivation of the land and the retail sale of its produce.

On the mountains and in the valleys where the olive is not grown and the vine is poor or does not thrive at all, and where the soil is never very fertile, the total yearly rent of a farm consisting of a house, about 2 ½ acres of cultivated land, 25 to 30 ha (62 to 74 acres) of stony pastures enough for two or three cows, and some little hay, besides 10 or 12 ha (25 to 30 acres) of wooded surface for the necessary fuel and litter, amounts to 150 to 250 fr. (£6 to £10).

There are also farms suitable for flower gardens; they are about 5000 to 7000 sq. metres (1 ¼ to 1 ¾ ac.) in extent, and with a house and stable are let for 600 to 1000 fr. (£ 24 to £ 40).

In good hill lands, farms consisting of a house, a stable and little over a hectare (2.47 ac.) of land under trees and vines command a rent of 800 to 1200 fr per ha (£12. 16*s* to £19. 4*s* per acre).

LOMBARDY.

Milan. — The territory of the Province of Milan is divided into two parts: the upper and the lower. They are distinguished by the different nature of the soil and of the crops.

In the upper part there are two types of tenure: in one, called also metayage, the owner gets one half of the silk cocoons and of the wheat produced; altogether from 10 to 14 fr. per Milanese perch (654.5 sq. met.) or 152.70 to 213.90 fr. per ha (£2. 8*s* 10*d* to £3. 8*s* 2*d* per ac.).

In the other, called " affitto a grano ", rent in wheat, the owner is paid 122 to 229 fr. per ha. (£1. 19*s* to £3. 13*s* 3*d* per ac.).

In the lower part of the province the average rent is 152.70 to 221 fr. per ha (£2. 8*s* 10*d* to £3. 10*s* 8*d* per ac.) with an absolute minimum of 122 fr. per ha. (£1. 19*s* per ac.) and a maximum of 305·60 fr. per ha (£ 4.17*s* 9*d* per ac.).

VENETIA.

Venice. — For large estates, the rent varies from 150 to 200 fr. per ha. (£2. 8*s* to £3. 4*s* per ac.). Farms up to 50 hectares (123 ½ acres) are rented at about 250 fr. per ha (£4 per ac.). Smaller lots, with house and enclosure, fetch 300 to 350 fr. per ha (£4. 16*s* to £5. 12*s* per ac.). The rent of low-lying lands, not completely reclaimed and liable to inundations is considerably less.

POLESINE.

Rovigo. — Rents vary from a minimum of 100 fr. per ha (£1. 12*s* per ac.) for the sandy soils which suffer severely from the summer drought, to a maximum of 350 fr. (£5. 12*s*) for the best lands especially in the upper Polesine.

EMILIA.

Bologna. — The fertile plains near Bologna, planted with trees and vines, and adapted to the production of hemp, are let, on average, at 250 fr. per ha (£4 per ac.); those somewhat more distant from the city at about 200 fr. (£3. 4*s* per ac.). Clay lands of middling fertility are rented at about 150 fr. per ha. (£2 8*s*).

In the province, good flat land is let at 150 to 160 fr per ha (£2. 8*s* to £2. 11s 2*d* per ac.).

Good soils in the hills near Bologna, excepting those under special fruit crops, are paid 150 to 200 fr. per ha (£2 8*s* to £3.4*s* per ac.); those further off only 100 fr. (£ 1.12*s* per ac.).

Market gardens around the city are let for 500 fr. (£ 8 per ac.) and upwards per ha.

Ravenna. — The lands in the belt called « delle larghe » are excellent, but without buildings; they are rented at 150 to 180 fr. per ha (£2. 8*s* to 2.17*s* 7*d* per ac.). Metayer farms of medium fertility and provided with buildings and plantations can be leased for 180 to 200 fr. per ha (£2. 17*s* 7*d* to £3. 4*s* per ac.).

In the vine growing part (Bagnocavallo, Russi, Fusignano) rents rise to 220 to 300 fr. (£ 3.10*s* 5*d* to £ 4.16*s* per ac.) and still higher for farms near the city.

Rimini. — Land is but rarely rented. Arable lands planted with rows of vines in the plain or on the lower hills are let for about 100 fr. per ha (£ 1 12*s* per ac.). Rents show a tendency to rise.

TUSCANY.

Maremma about Grosseto. — In the plain the average rent is between 50 and 75 fr. per ha (16*s* and 24*s* per ac.). Large estates in the plain or on the hills, about 50 fr. (16*s* per ac.) but sometimes even less. Even as low as 20 fr. (6*s* 5*d* per ac.) is paid for very large estates with olive trees, etc.

Province of Pisa. — In Tuscany, with the exception of the Maremma, it is not customary to rent land, owing to the prevalence of the metayer system; nevertheless here and there limited areas are sometimes let, and in some cases whole estates.

In the province of Pisa, small farms of ½, 1 or at most 2 hectares (1 ¼, 2 ½ or 5 acres), buildings not included, cultivated by the lessee himself, can be had for the following rentals:

Clay lands without vines on them, 120 to 130 fr. per ha (£1. 18*s* 5*d* to £ 2.1*s* 7*d* per ac.).
Middling fertile arable loams and with rows of vines on them, 200 to 250 fr. (£3. 4*s* to £4 per ac.).
The best arable soils, with rows of vines on them, 270 to 360 fr. (£4. 6*s* 5*d* to £5. 15*s* 2*d* per ac.).

In the plain of Navacchio and of Cascina where the soil is very fertile and cultivation is intensive: market gardening on a large scale (cabbages, potatoes, artichokes), the rent varies from 396 to 414 fr. per ha (£6. 6*s* 8*d* to £6. 12*s* 6*d* per ac.).

If several farms or whole estates of no great extent are let, the following are the usual rents:

Clay lands without rows of vines, 100 to 120 fr. per ha (£1. 12*s* to £1. 18*s* 5*d* per ac.).
Medium fertile arable loams with vine rows, 150 to 180 fr. per ha (£2. 8*s* to £ 2.17*s* 7*d* per ac.).
The best arable lands with vine rows, 200 to 220 fr. per ha (£3. 4*s* to £3. 10*s* 5*d* per ac.).

Generally the lessee buys the livestock, and is debited with the amount of the other accessory stock of the farm, such as hay, straw, machinery, etc. At the end of the lease he is paid for the live stock he leaves, and is credited with the amount of accessories he returns to the lessor, the difference, if there is any, being settled by a cash payment.

The meadows near the city of Pisa are let for about 108 fr. per ha (£1. 14*s* 7*d* per ac.).

In the hills rents are somewhat lower.

Province of Lucca. — In this province land is not usually rented. In Versilia, the part of the province lying on the sea coast, the sandy non-irrigable soils are let at from 130 to 160 fr. per ha (£2. 1*s* 7*d* to £2. 11*s* 2*d* per ac.). Sandy irrigable low lying lands let for 150 to 190 fr. per ha (£2. 8*s* to £3. 0*s* 9*d* per ac.).

The medium compact soils of Camaiore and Seravezza command the same prices.

In the irrigated plain of Lucca the rent is paid in kind, and corresponds to 240 to 320 fr. per ha (£4 to £5.2*s* 5*d* per ac.)

but there is a marked tendency towards a fall in rent owing to emigration.

On the hills about Lucca in the Serchio valley and in Valdinievole rents range from 200 to 220 fr. per ha (£3. 4*s* to £3. 10*s* 5*d* per ac.); there are some lands along the river Pescia used as market gardens and nurseries which fetch as much as 700 to 1000 fr. per ha (£11. 4*s* to £16 per ac.).

MARCHES.

Province of Macerata. — For average sized farms the rent varies from 80 to 115 fr. per ha (£1. 5*s* 7*d* to £1. 16*s* 10*d*) according to the fertility of the soil.

Province of Ancona. — In large estates in the hills, the rent is 70 to 80 fr. per ha (£1. 2*s* 5*d* to £1. 5*s* 7*d* per ac.) ; in medium sized ones 90 to 100 fr. (£1. 8*s* 9*d* to £1. 12*s* per ac.), and in small ones 110 to 120 fr. per ha (£1. 15*s* 2*d* to £1. 18*s* 5*d* per ac.).

In the plains 120 to 140 fr. per ha (£1. 18*s* 5*d* to £2. 4*s* 9*d* per ac.) is an average rent.

Market gardens near towns, if well provided with water, fetch 200 to 250 fr. (£3. 4*s* to £4 per ac.).

UMBRIA.

Flat land without vines or trees, average 100 fr. (£1. 12*s*).
Hill lands » » » » 75 » (£1. 4*s*).
Oliveyards, 150 to 180 fr. (£2. 8*s* to £2. 17*s* 7*d*).
Flat land with vines in rows, 125 fr. (£2).
Vineyards . . . . somewhat less.

LATIUM.

In the *Agro romano*, the rent for fairly large estates without vines or trees varies from 50 to 80 fr. per ha (16*s* to 25*s* 7*d* per ac.) according to the nature and fertility of the soil, and the distance of the property from Rome.

In the neighbourhood of Frosinone the following are average rents:

Poor soils.	45 fr. par ha	(14*s* 5*d* per acre ,
Medium fertile . . .	55 » » »	(17*s* 7*d* » »)
Fertile	80 » » »	(25*s* 7*d* » »)

Small lots of ½ to 1 ½ ha (1.2 to 3.6 acres) are let at 50 to 90 fr. per ha (16*s* to 28*s* 9*d* per ac.).

ABRUZZI AND MOLISE.

(From the Parliamentary Enquiry into the Conditions of the Peasantry in the South of Italy and in Sicily, Vol. II, T. I. — Report of Dr. Jarach).

Communes in the valley of the Aterno, Fossa Paganica, S. Demetrio:

The poorest lands in the plain, 88 to 96 fr. per ha (28*s* 2*d* to 30*s* 8*d* per acre).

The best lands, 224 to 240 fr per ha (£3. 11*s* 8*d* to £3. 16*s* 8*d* per ac.).

These prices are for small lots in which potatoes, maize and pulse are grown.

In the Abruzzi the custom of renting land is common. Rents vary to a great extent.

CAMPANIA.

Province of Naples. — The highest rents for the best irrigable lands for market gardens near Naples range from 850 to 900 fr. per ha (£13. 12*s* to £14. 8*s* per ac.) and exceptionally attain 1000 fr. (£16).

In the rest of the province the same lands fetch from 450-650 to 700 fr. per ha (£7. 4*s*, £10. 8*s* to £11. 4*s* per ac.) according to the supply of water.

Other parts of Campania (Bordiga): *Plain of Fondi*: good lands 84 to 90 fr. (26*s* 10*d* to 28*s* 9*d* per ac.).

Sessa Aurunca: Small holdings of 1 ½ ha (3 ¾ acres) are let at 90 to 120 fr. per ha (28*s* 9*d* to 38*s* 5*d* per acre).

Lower Volturno valley: The best arable lands 150 fr. (£2. 8*s* per ac.). Arable lands planted with vines 170 to 190 fr. (£2. 14*s* 5*d* to £3. 0*s* 9*d* per ac.).

Sparanise and Teano: Arable lands, planted with olives 80 to 90 fr. (25*s* 7*d* to 28*s* 9*d*) and 100 to 120 fr. (32*s* to 38*s* 5*d* per ac.).

Plain of Eboli: Farms, partly irrigated, and provided with buildings, 150 to 160 fr. per ha (£2. 8*s* to £2. 11*s* 2*d* per ac.).

Arable lands: poor and stony, 66 fr. (21*s* 1*d* per ac.), with pastures and woods 33 to 50 fr. (10*s* 7*d* to 16*s* per ac.), good arable lands 15 fr. (£ 2.8*s* per ac.).

Hill and mountain land for extensive cultivation, in the neighbourhood of Ariano and S. Angelo dei Lombardi 20-30-50-60 fr. per ha (6*s* 4*d*,9*s* 7*d*,16*s*,19*s* 2*d* per ac.) according to situation and fertility

The best pastures in the Matese district : 60 to 70 fr. (19*s* 2*d* to 22*s* 5*d* per ac.) ; ordinary pastures 25 to 30 fr. (8*s* to 9*s* 7*d* per ac.) and even less.

First class hemp soils (Casoria, S. Pietro a Patierno, Caivano, Afragola, etc., are let at 400 to 500 fr. (£6. 8*s* to £8 per ac.), second class hemp soils (Maddaloni, Caserta, S. Maria di Capua, Aversa, Acerra, etc.) 300 to 400 fr. (£4. 16*s* to £6. 8*s* per ac.).

In the drier lands, such as the lowest slopes of Vesuvius, the rents sink to 220 to 280 fr. (£3. 10*s* 5*d* to £4. 9*s* 7*d* per ac.).

In the Avellino district, the best arable lands inter-planted with vines and fruit trees are rented at 220 to 250 fr. (£3. 10*s* 5*d* to £4 per ac.); on the hills, in the environs of Ariano, S. Angelo and Beneventano, rents fall to 180-150-130 fr. (£2. 17*s* 7*d*—£2. 8*s*—£2. 1*s* 7*d*).

The irrigable arable lands of Scafati, Angri, Poggiomarino, etc. are let at 250 to 450 fr. per ha (£4 to £7. 4*s* per ac.).

The rents of vineyards vary within wide limits, from 80 to 200 fr. (25*s* 7*d* to £3. 4*s* per ac.) in the environs of Ariano, S. Bartolomeo, Campagna, etc. up to 450-500 fr. (£7 4*s* to £8 per ac.) in Ischia and at Pozzuoli.

Orchards on the slopes of Vesuvius are let at 300 fr. per ha (£4 16*s* per ac.), if under citrus fruits 425 to 450 fr. (£6. 16*s* to £7. 4*s* per ac.).

Province of Salerno: On the Amalfi coast the rent paid for small patches under citrus fruits reaches 1500 to 2500 fr. per ha (£24 to £40 per ac.) and upwards.

About Nocera small areas especially used for market gardens are paid 600 to 700 fr. per ha per annum (£9. 12*s* to £11. 4*s* per ac.).

Where tobacco is grown, as near Cava de' Tirreni etc., and about Mercato S. Severino, where vines, potatoes, tomatos, onions and maize are grown, rents range from 400 to 600 fr. (£6. 8*s* to £9 12*s* per ac.).

In the plains of Battipaglia, the rent for farms of 100 to 200 ha (250 to 500 acres) is 150 to 200 fr. per ha (£2. 8*s* to £3. 4*s* per ac.) and reaches 250 fr. (£4 per ac.) for smaller and irrigable farms.

In other parts of the province, in the hills or on the mountains where there is much emigration and the soil is not very fertile, rents range from 50 to 150 fr. per ha (16*s* to £2.8*s* per ac.).

BASILICATA.

Western or mountainous part (from the Parliamentary Enquiry into the Conditions of the Peasantry in the southern provinces of Italy and in Sicily, Vol. V, T. I. Report of Prof. E. Azimonti).

Commune of Anzi, lands partly arable and partly pastures and woods, 11.32 to 35 fr. per ha (3*s* 7*d* to 11*s* 2*d* per ac.).

Commune of Pietrapertosa, Woods of Montepiano: 5 to 8 fr. (1*s* 7*d* to 2*s* 7*d* per ac.).

Commune of Laurenzana, pasture in the woodlands 0.94 fr. (3*s* 6*d* per acre).

Commune of S. Severino Lucano, pastures 2 fr. per ha (8*d* per ac.).

Congregazione di Carità of Moliterno, arable lands 17 to 20 fr. per ha (5*s* 5*d* to 6*s* 5*d* per ac.).

APULIA.

Province of Bari: The rents of market gardens at Bari vary from 250 to 500 fr. per ha (£4 to £8 per acre).

Province of Foggia:

Lands near the town, 81 to 94 fr. per ha (25*s* 11*d* to 30*s* 1*d*).
Lands at a distance from town, 61 to 77 fr per ha (19*s* 6*d* to 24*s* 8*d*).
Dry calcareous soils, 45 to 61 fr. per ha (14*s* 5*d* to 19*s* 6*d*).
Good pastures, 16 to 24 fr. per ha (5*s* 1*d* to 7*s* 8*d*).
Very good pastures, 40 to 49 fr. per ha (12*s* 9*d* to 15*s* 8*d*)

SICILY.

(From the Parliamentary Enquiry into the Conditions of the Peasantry in the Southern Provinces of Italy and Sicily, Vol. II, T. I Report of Prof. G. Lorenzoni).

Arable and grazing lands.

Piazza Armerina, 1905-1907	44,77 to 166,60 fr. (14*s* 4*d* to £2. 13*s* 4*d* per acre).
Terranova, 1890-1896 . . .	104,38 to 199,15 fr. (£1. 13*s* 5*d* to £3. 3*s* 9*d* per ac.).
Caltanisetta, 1906-1907, . .	20,56 to 104,61 fr. (6*s* 7*d* to £1. 13*s* 5*d* per acre).
Acireale (arable, trees) 1907	214,80 fr. (£3. 8*s* 9*d* per acre).
Caltagirone, 1906	16,66 to 34 fr. (5*s* 4*d* to 10*s* 10*d* per acre).
Catania, 1907	30,95 to 64,42 fr. (9*s* 11*d* to 20*s* 7*d* per acre).
Nicosia, 1900-1908	14,31 to 63,50 fr. (4*s* 7*d* to 20*s* 4*d* per acre).
Bivona, 1906-1908	28,57 to 76,22 fr. (9*s* 1*d* to 24*s* 4*d* per acre).
Girgenti, 1904.	82 to 95 fr. (26*s* 3*d* to 30*s* 5*d* per acre).

Sciacca, 1906-1907	20,41 to 59,00 fr. (6s 6d to 18s 10d per acre).
Castroreale, 1905-1906 . . .	16,38 to 87,97 fr. (5s 3d to 28s 2d per acre).
Messina (arable, trees) 1907	121,49 to 283 fr. (£1. 18s 10d to £4. 10s 7d per acre).
Mistretta, 1907	44,80 to 59,74 fr. (14s 4d to 19s per acre).
Cefalù, 1906-1907	29,70 to 87,90 fr. (9s 6d to 28s 1d per acre).
Corleone, 1906.	15,86 to 32,09 fr. (5s 1d to 10s 3d per acre).
Palermo, 1907.	25,00 to 98,86 fr. (8s to 31s 10d per acre).
Termini Imerese, 1907-1908	115,05 to 120,88 fr. (£1.16s 10d to £1.18s 8d per acre).
Modica, 1907	12,46 to 98,07 fr. (4s to 31s 4d per acre).
Noto, 1906-1907	43,01 to 53,01 (13s 9d to 16s 11d per acre).
Siracusa, 1907	37,78 to 58,92 fr. (11s 10d to 18s 10d per acre).

Province of Trapani: (Direct information, 1912). Rents are very variable, according to the fertility of the land and to its distance from the dwellings of the peasants.

They vary, for bare lands, from 45.60 to 76.50 fr. per ha (14s 7d to 24s 6d per ac.) on account of the competition among agricultural co-operative associations.

For limited plots of land (spezzoni) taken up by small farmers (borgesi) the above figures must be increased by 7.60 to 15.20 fr. per ha (2s 5d to 4s 10d per ac.) and upwards, reaching sometimes 100 fr. per ha (£1. 12s per ac.).

Near towns, good arable lands attain 153 fr. (£2. 9s per ac.). Market gardens 150 to 300 fr. per ha (£2. 8s to £4. 16s per ac.).

Pastures in the large estates (latifondi) fetch from 38.35 to 45.60 fr. per ha (12s 3d to 14s 7d per ac.).

GIODA, ALESSANDRO. **Proposals for the Formation of a Model Agricultural Contract.** (Relazione e proposte per la formazione di un contratto agrario modello). — *Estratto dal Bollettino del Consiglio Agrario di Mondovì.* Opusc., pp. 16. Mondovì, 1911. **557**

The Executive Council of the Agricultural Society of Mondovì has a special committee entrusted with the study of the agricultural contracts which are in force in the neighbourhood, and with the task of drawing up a typical contract for each of the principal systems of land tenure. **Italy**

The proposals made are as follows:

The Termination of Contracts.

1. The notice to quit may be dated, according to Piedmontese custom, up to March 30th, for the following Martinmas (11th November).

2. At Martinmas the out-going tenant must give up the land, without any right to the pasturage still available.

3. The clovers, unless sown in March by the in-coming tenant, must be reimbursed to the out-going farmer, only for the value of the labour, the seed and manure employed.

4. It should be incumbent on the owner at that time to buy the hay which is in excess of the provision for the season, at an estimated price as regards quality and quantity, due regard being paid to the burdens established by custom as regards the fertility of the soil.

5. The out-going tenant may not up to 11th November consume more than one-third of the straw produced in the year.

6. The out-going tenant may have during the year only the wood that he requires for his own use and must not remove any for whatsoever reason.

7. The out-going tenant may not sow winter cereals in greater quantity than that fixed by the rotation usage of the district; it is better to determine this limit as one half, or at the utmost three-fifths, of the whole area to be sown.

8. The owner may, if he pleases, buy the prospective crops to which the out-going tenant might still have a right (*e. g.*, wheat) if in the month of November he has an estimate made of the probable net yield in the following July, after deducting the cost of harvesting, threshing, etc., as well as a certain allowance for accidents.

As regards the duration of contracts, the Committee is of opinion that whether in the case of an ordinary lease, or in the case of a *métairie* (where the proprietor receives one half of the produce as rent), they ought to begin with a minimum term of three years. After this a tacit renewal of the contract — not for the same period, but only from year to year — would be the best course.

Nevertheless, since the question of improvements made on the estate by the tenant is closely connected with the renewal of the contract, the Committee recognises that, where the tenant is not allowed indemnity for the improvements carried out, it is necessary to concede — deplorable as it is under many aspects — a longer notice to quit, with a correspondingly longer term for the contract.

Improvements and Indemnity.

The Committee has shown considerable reserve with regard to improvements on the land, and expresses the hope that no limit be placed on a reasonable indemnity for agricultural improvements, and hence proposes:

1. That the principle of indemnity for improvement carried out on an estate be recognised and admitted in so far as the cultivator may have been unable to benefit by them for a period sufficient to amortize his outlay, and in so far as the alleged improvements occasion no damage or depreciation chargeable to him.

2. That in the case of improvements on the estate of a permanent and extraordinary character (such as levelling, draining, irrigation, planting), the tacit consent of the owner shall be sufficient to justify the indemnity, provided a Committee of experts decide that from the said improvements the value of the estate will be so far increased as to exceed the ordinary interest on the capital invested in the carrying out of the same.

3. That in such a case indemnity as estimated by experts for the completed work shall be paid by the proprietor as follows: 3/5 of it in annual rates not exceeding 10 % of the annual income derived by the landlord from the estate; the remaining 2/5 to be disbursed, when the payment of these rates is finished, and provided the permanent utility of the improvements be still recognised. In case of a lease, the lease-holder shall pay the proprietor 4 % interest on the rates so disbursed. In no case shall the outlay for improvements exceed the landlord's net income for one year, when the contract is triennial; that for two years, on a six-year contract; and that for three years, on a nine-year one.

4. That for improvements on the estate relating to buildings there shall be a right to indemnity only when the written permission of the landlord has been obtained; the sole exception being when the said improvements are absolutely and urgently necessary for the health and safety of man and beast, according to the regulations laid down by sanitary and other legislation.

5. That in case of such improvements, when the landlord's consent is withheld, the cultivator shall be allowed to sell any excess of straw or forage that he may have, provided he uses a given quantity of chemical fertilisers in addition to the usual manuring; in accordance with an apposite compensation tariff to be drawn up by the Society.

6. That for agricultural improvements the indemnity shall be estimated only on the expiration of the contract, according to an apposite compensation tariff which the Society will formulate.

7. That the indemnity shall not include the partial renewal of plantations of trees, and the making of new meadows, corresponding to the breaking up of old ones.

8. As regards the property of charitable institutions the leaseholder shall have the preference up to 5 % less than the amount offered by the highest bidder in the competition for the tenure, provided always this does not mean a diminution of the rent he previously paid.

9. In case the administration should think fit to extend this preference to the out-going tenant, a sum corresponding to 5 % of the highest offer shall be paid to him, during the whole period of the lease, as indemnity for improvements, in three annual rates.

And in connection with the above the following should be noted ·

10. During the last two years of his lease the tenant shall make no essential change in the manuring and rotation systems previously adopted.

11. All the credit for improvements allowed to the out-going tenant shall be debited to the new lease-holder.

Complete or partial Métairie (half-share Contracts).

Another point about which the Committee were interested in knowing the opinion of the farmers of the neighbourhood is that which concerns the possible adoption of the complete *métairie, i. e.*, where the live-stock is also included in halving the profits, because it is well known that in the district almost all the *métairie* (half-share contracts) only apply to the grain harvest or the seeds, and not to the meadows. This mixed form of contract is, however, very harmful, as it tends to check the spread of leguminous forage.

But on this point, as is clear from the replies quoted by the writer, neither proprietors nor farmers consent to the proposal. The Committee therefore, though still holding that the complete *métairie* (half-share contract), where the conditions are favorable, is the best form of share contract, proposes that those landlords, who cannot or will not give attention to the cattle, and prefer to go on letting their meadows, should insert in their contracts the following clause, which would go far to lessen the most serious drawback.

" It shall be allowed to the farmer who has a *métairie* contract to cultivate with leguminous forage plants a portion not exceeding one-fourth of the area of his arable land, as may be most to his advantage, and he shall pay the landlord a corresponding increase of rent, amounting to *x* francs per hectare. And he must declare before 15th April in every year what area of his leguminous crops he intends to keep down as meadow during the year.

" It shall be incumbent on the landlord to contribute half the cost of the chemical fertilisers for the said leguminous crops, according to the formula which the Agricultural Society may submit as the best ".

As a model it may be stated that similar clauses have been adopted on the plain of the Tanaro near Alba, and that the conditions of rental vary from 50 to 75 francs per hectare (16*s.* to 24*s.* per acre).

In order to understand fully the value of the model contract which the Committee proposes to formulate, it should be remembered that there can be no absolute rigid rules for any contract, and that the Society intends always to allow the widest liberty in this direction, according to the different intrinsic and extrinsic conditions in each case.

558 HANSEN, I. **Economic Data respecting Four Years' Work connected with the Experimental Farm of Dikopshof.** — *Zweiter Bericht vom Dikopshof,* 1 Vol. pp. IX + 430; Betriebsergebnisse, pp. 11-33. Berlin, 1911.

Germany

Some changes having been recently made at the experimental farm of Dikopshof, the present area under cultivation is apportioned as follows:

Dikopshof.	Acres
Area of arable land including 1.11 ha. (2.74 acres) which is rented	283.29
Garden	1.88
Pasture	9.44
Wood	1.38
Yards, including manure pits, of 16 ares (1900 sq. yds.)	2.87
Area occupied by buildings	1.24
Nursery	1.11
Roads	6.70
Ditches	1.19
Gravel-pit	0.52
Total	309.62 Acres

Maarhof.

	Acres
Area of arable land	3.88
Garden and orchard	1.19
Buildings, yards, roads etc.	0.62
Total	5.68 Acres
General Total 127.61 ha.	315.33 Acres

Average production of the different crops per acre from 1904 to 1909.

Crop	Number of years	Area cultivated Acres	Production per Acre				
			Grain cwt	Roots cwt	Straw. cwt	Hay. cwt	Green Forage cwt.
Wheat	6	164.58	21.08	—	37.92	—	—
Summer wheat . . .	5	44.18	16.31	—	38.97	—	—
Rye	6	309.83	21.88	—	43.77	—	—
Barley	5	30.82	26.81	—	42.39	—	—
Summer barley . . .	6	50.63	21.18	—	30.36	—	—
Oats	6	292.36	24.29	—	35.28	—	—
Rape	3	15.32	13.44	—	—	—	—
Sugar beet	6	287.12	—	245.30	—	—	—
Mangolds	6	86.22	—	673.46	—	—	—
Potatoes	6	71.41	—	103.20	—	—	—
Jerusalem artichokes.	3	1.04	—	133.86	—	—	—
Clover	6	169.32	—	—	—	59.80	—
Lucerne	5	129.88	—	—	—	51.71	—
Vetches	3	50.83	—	—	—	—	155.75
Green maize	6	30.10	—	—	—	—	399.57

Average Receipts and Expenses.

Average receipts per acre of cultivated land 1905-1909.

	£ s. d.	£ s. d.
Crops :		
Cereals and colza	3· 3·7 ½	
Potatoes, straw etc.	6.6 ½	
Sugar beets	2. 0.0	
Leaves of sugar beets	4·3 ½	
		5·14· 5 ½
Draught animals :		
Horses	5 ¾	
Cattle	4·7 ¾	
		5· 1 ½
Stock :		
Cattle	2. 4·4	
Pigs for fattening and for breeding	1. 6.0	
Sheep and wool	8 ½	
Poultry	10 ½	
		3·11.11
Dairy Produce :		
Milk sold at Bonn	7.11. 1 ¾	
Milk and butter sold at Dikopshof	12.10 ½	
		8. 4. 0 ¾
Sundries :		
Shooting rights	1. 7 ½	
Various receipts	1. 6 ¾	
State grants for experimentation	1.16. 5 ½	
		1.19. 7 ¾
Total receipts per acre		£ 19.15. 2

Average expenses per acre of cultivated land 1905-1909

	£ s. d.	
Enlargement and upkeep of buildings	1. 2. 2 ½	
Increase of draught animals . .	5. 9	
» of breeding » . .	2.12. 2 ½	
Purchase and upkeep of machines etc.	1. 3. 7	
Wages aud piece work	5. 5.10 ¼	
Labourer's food	1 3.11 ½	
Heating and lighting	7. 7 ½	
Insurance	12. 1 ¼	
Working expenses of dairy . . .	11. 4 ¼	
Various rents	2. 4 ¼	
Food stuffs	3. 4. 1 ½	
Manures	1. 2. 8 ¾	
Seeds	9. 0	
General expenses	7. 8 ¼	
Total . . .		£ 18.10.7
(Including £ 4.4s. 4d. for experimentation).		
Profit		1. 4. 7
		£ 19.15. 2

Capital per acre of cultivated land.

	£ s. d.	£ s. d.
Buildings		25.10. 9 ½
Live stock :		
Horses	1. 0. 3 ¼	
Draught oxen	11. 6 ¾	
Breeding cattle	5.14. 4 ½	
Pigs	14. 3	
Sheep	1. 9	
Poultry	5 ¾	
		8. 2. 8 ¼
Dead stock		8. 7. 4 ¾
		£ 42. 0.10 ½

The total increase of the value of buildings and live and dead stock at the end of 1909 was £ 300.13*s*. 5*d*.

Comparative Value of Farm Lands, Buildings, Machinery, etc. in the South and in the United States. — *Manufacturers' Record*, 60 (1911) No. 5; *E. S. R.*, Vol. XXV, No. 8, pp. 789. Washington, 1911. 559

United States

This article presents by notes, statistics, and illustrations the agricultural progress of the South from 1900 to 1910. Compared with the country as a whole the increases in certain farm lines are shown as follows:

Comparative value of farm lands, buildings, machinery etc.; in the South and in the United States.

	The South			The United States		
	1900	1910	Increase	1900	1910	Increa
	$	$	%	$		%
Farm lands value. .	2 388 593 000	5 209 676 000	118	13 051 033 000	28 383 821 000	118
Farm buildings value	685 188 000	1 314 429 000	92	3 556 614 000	6 294 025 000	77
Machinery etc. value	167 349 000	262 090 000	57	749 778 000	1 261 817 000	68
Improved acreage .	116,[illegible]81 000	131 958 000	13	414 490 000	477 424 000	15
Fertilizers cost. . .	29 006 000	74 703 000	157	53 630 000	114 273 000	113
Labor cost . . .	81 781 000	149 463 000	82	357 393 000	651 862 000	82

Additional tables are given showing the aggregate value of farm lands by States, also the value of farm buildings and farm machinery, improved acreage, expenditures for labor and fertilizers, average value per acre of lands alone, and values of 12 leading crops in 1900 and 1910.

BILLINGS, GEO. A. and BEAVERS, J. C. **Systems of Farming in Central New Jersey.** — *U. S. Dept. of Agric., Farmers Bulletin 472.* Washington, December 1911. 560

United States: New Jersey

The Section of which this Bulletin treats is situated in the coastal plain region of central New-Jersey.

There are few sections in the United States where soil fertility and profitable farming have been so generally maintained as in central New Jersey, although the land has been farmed for more than 150 years.

The soil, the climate, and the location render central New Jersey well adapted both to general and to specialized farming.

This Bulletin discusses the prevailing systems and describes some of the methods followed by the more successful farmers.

In order to show the financial returns on the high-priced farm land in this section, a farm was selected having conditions as nearly typical as possible in respect to soil, type of farming, and cropping system, and at the same time having records for a long period of time. The tenant farm described below fulfils these conditions, with the possible exception that the soil is a little heavier than on the majority of farms in this section

This farm, situated 1 ½ miles from the village and containing 175 acres, was purchased by the present owner in 1868 for $ 150 per acre. It was necessary for the purchaser to go heavily in debt when the purchase was made. This debt was paid gradually by the sale of products from the farm. In 1896 the owner had accumulated sufficient wealth to enable him to retire from active farm life and move to a very comfortable home in town. When the owner made the change, one of the men who had been employed on the farm as a laborer for several years rented the farm. He had saved up $ 1000 and had to go in debt about $ 2000 more for work stock, farm machinery, etc.

The tenant has remained on the farm continuously since that time, and has by careful management not only maintained crop productiveness, but has made the farm profitable to both owner and tenant.

The tenant owns now all the farm machinery and work stock, and all the productive live stock is owned jointly by landlord and tenant. The landlord pays for all repairs and improvements, for all lime and manures purchased, and for three-fifths of the fertilizer. The amount expended for seeds, spraying material, and the like is shared equally. The tenant furnishes all of the labor. The net proceeds from the sale of all farm crops, live stock, and dairy products are divided equally. The live stock are fed from the undivided crops, except that grain for the work horses is furnished by the tenant from his share of the corn crop. In addition to the above the tenant gets all the milk and butter necessary for the family use, and both he and the landlord get all their potatoes and fruit in season from the farm.

The general practice, on this farm, has been to grow from 20 to 25 acres of corn, 25 to 32 acres of potatoes, 20 to 25 acres of wheat, with the remainder of the land, about 75 acres, in hay.

The area of sod broken each year is about equal to the area seeded to clover and grass. The general rotation has been (1) corn, (2) potatoes, (3) wheat, (4) clover and timothy, and (5) timothy.

Labor and Equipment.

The tenant keeps three men besides himself throughout the year, and one extra man from April 1 to November 1; that is, outside of his own labor, one man for each team during the working season.

Four work teams are required on this farm in order to get work done in season, which means about one man and team for every 37 ½ acres of cultivated crops, grain and meadows, or for about each 20 acres of cultivated crops and grain.

The farm buildings consist of one storage and stock barn, two hay storage barns, one fertilizer and seed storage building, corn-cribs, and tool sheds.

The inventory of tools and live stock belonging to the tenant is given in the following table:

Number	Item	Value $
5	Wagons, two horse at $ 75 each . . .	375.00
1	Spring wagon, one horse	45 00
4	Sets double harness at $ 25 each . .	100.00
1	Set single harness	20.00
1	Set light double harness	30.00
1	Platform scale, movable	10.00
1	Fan, hand power	9.00
1	Corn sheller, hand power	3.50
1	Vegetable or root chopper	4.00
1	Wheelbarrow	2.00
1	Road drag, two-horses	3.00
1	Fertilizer drill	1.00
2	Potato wagon bodies at $ 15 each .	30.00
3	Hay shelvings at $ 15 each	45.00
1	Wheelbarrow seed sower	5.00
2	Fertilizer riddles at $ 1 each	2.00
1	Fertilizer distributor at $ 15, half interest	7.50
1	Roller or clod crusher, at $ 8, half interest	4 00
1	Wheat drill, at $ 75, half interest . . .	37.50
1	Paris green dusting cart at $ 40, half interest.	20.00
1	Corn harvester, six years' use	75.00
1	Wheat binder, eight years' use	70.00
1	Potato planter, two-horse	40.00
1	Potato digger, four-horse	65.00
3	Breaking plows, two-horse, at $ 7 each .	21.00
1	Turning and slicing harrow, three-horse	10.00
1	Spring-tooth harrow, two-horse	10 00
	Carried forward	1044.50

	Brougt forward	1044.50	
2	Disk harrows, two-horse, at $ 16 each	32.00	
1	Lever drag harrow, two-horse	5.00	
2	" α " harrows, two-horse, at $ 11 each	22.00	
4	Cultivators, one-horse, at $ 3 each	12.00	
3	Cultivators, two-horse, at $ 30 each	90.00	
2	Mowers, two-horse, at $ 38 each	76.00	
1	Hay tedder, two-horse	30.00	
1	Hayrake, two-horse, dump	15.00	
1	Hayrake, two-horse, side delivery	65.00	
1	Hay loader	65.00	
3	Hayforks, for elevating hay in barn, at $ 8 each	24.00	
	Rope for hayforks	10.00	
	Small tools, etc	100.00	
			$ 1590.50
Live stock			
	8 Horses at $ 200 each		1600.00
Farm stock owned jointly by landlord and tenant.			
10	Head of cattle at $ 40 each, half interest	200.00	
3	Brood sows, at $ 20 each, half interest	30.00	
1	Boar, at $ 25, half interest	12 50	
			$ 242.50
	Tenant's total investment		$ 3433.00

The list of farm tools is very complete and the tools are kept in good repair

The list may be taken as fairly representative of what is required in this type of farming.

Very few articles could be dispensed with without inconvenience except the corn binder, now seldom used. Corn (maize) is cut and shocked by hand, because the tenant believes the hand method to be the more economical.

The cost of equipment, outside of buildings, on this farm is seen to be about $ 23 per acre of tilled land (150 acres). The capital invested in implements and machinery amounts to $ 20,60 per acre, that invested in work stock $ 10,65 per acre, and in other stock $ 2,62. The system of farming does not require the keeping of large power machinery.

The following table gives the income and expenses of the landlord as taken from his books for the 10-year period from 1900 to 1909 inclusive:

INCOME

	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
	$	$	$	$	$	$	$	$	$	$
Potatoes	615,32	1 695,00	1 262,00	926,57	1 369,74	1 233,44	1 450,00	2 993,77	2 194,65	1 514,93
Hay	604,43	780,97	484,10	684,95	732,85	384,17	889,37	1 007,96	1 095,34	977,28
Wheat	162,34	169,90	196,00	274,40	313,50	212,50	323,23	316,35	313,90	362,87
Live stock	486,47	375,85	496,08	453,58	453,92	528,43	472,92	526,48	361,72	444,49
Boarding horses . . .	—	—	75,00	38,50	70,70	75,00	121,42	167,20	433,19	367,32
Miscellaneous (fruit, corn, etc.)	52,50	13,90	285,50	107,03	53,98	39,00	272,06	305,41	315,66	255,00
Total . . .	1 921,06	3 035,62	2 799,58	2 488,03	3 014,69	2 472,50	3 533,00	5 317,17	4 714,46	3 921,89

EXPENSE

	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Seeds	109,65	111,62	93,29	141,63	150,00	172,45	138,25	180,50	236,30	189,51
Live stock	55,00	29,50	38,50	45,62	95,00	47,00	43,75	39,50	104,50	39,25
Fertilizer	484,20	538,20	696,55	444,00	420,00	420,00	447,75	477,75	479,96	686,52
Repairs (buildings, fences, etc.)	—	—	—	—	—	—	—	243,00	—	120,00
Miscellaneous: Lime, Paris green, feed, etc.	15,68	10,36	16,14	136,20	26,00	528,25	33,50	154,00	17,40	119,73
Total . . .	664,53	689,68	844,48	767,45	691,00	1 167,70	663,25	1 094,75	838,16	1 155,01
Net profit . . .	1 256,53	2 845,94	1 955,10	1 720,58	2 323,69	1 304,84	2 869,75	4 222,42	3 876,30	2 766,88

In addition to the receipts shown in the preceeding table, the landlord has received sufficient feed from the farm to board two horses, which at average farm prices for 10 years would be worth $ 110 per horse, or $ 220 for the two horses for each year. The additional perquisites which the owner receives from the farm are probably worth $ 30 per year, which makes the additional income equivalent to $ 250 per year.

Against this must be charged the farm taxes and insurance, which averages between $ 170 and $ 180 per year. Deducting $ 180 for taxes and insurance from $ 250, the value of perquisites, there is left $ 70, which should be credited to the farm income.

The valuation of the 175 acre farm at present is $ 35 000. During the 10 year period, of which account is given, the average net profit to the landlord has been $ 2524.20 besides perquisites to the amount of $ 70 or more. This gives an interest of 7 1/4 per cent per annum on a valuation of $ 200 per acre.

No accurate account of the net income of the tenant farmer is available, except that for the 13 years he has operated the farm he has been able to save $ 500 per year after paying all expenses.

He has brought up a family, and for the greater part of this period he was required to hire a housekeeper.

From the detail of expenses of both the landlord and tenant for seed, fertilizer, and lime, some interesting figures can be deduced. During the 10 years the average cost of seed potatoes has been $ 8.50 per acre planted. It has been necessary to spray for potato bugs with Paris green 7 of the 10 years, and the average annual cost of materials has been about $ 1 25 per acre sprayed.

Commercial fertilizer has been one of the big expenses on this farm and the average annual expense for this purpose has been $ 5.66 for each acre in cultivation. The cost of grass and clover seed about $ 2.50 to the acre of grass sown

Lime has not been used on the farm every year, but since its use has become more prevalent, there has been a marked improvement in the yield of crop, especially of clover and timothy. The average expense for each of the seven years since the use of lime, including years when no lime was used, is $ 115.82 a year.

A more carefully laid farm plan, the rearrangement of fields in order to save labor and establish a more definite rotation, and the growing of more legumes, either as cover crops or as a regular farm crop, are the principal suggestions for this section.

LLOYD, W. A. **A Successful Alfalfa and Truck Farm in South-eastern Ohio.** — *Ohio Agricultural Experiment Station: Circular* No. 107, pp. 1-20. Wooster, Ohio, 1911. **561**

The farm under discussion is located in Star Township, Hocking County near the town of Haydenville. It is five miles from Nelsonville, Ohio, a town of eleven thousand inhabitants.

United States: Ohio

The farm contains 500 acres of land. It lies on both sides of the Hocking River and consists of 120 acres of fine sand and silt loam, river bottom land, and 380 acres of hill land, 200 of which are in permanent pasture and the remainder in timber.

The permanent live stock consists of four milch cows, ten work horses and one brood sow; on the pasture from 150 to 250 sheep are kept; from 15 to 20 hogs are fattened annually. A flock of 200 hens is kept. The bottom land, which is the only part of the land occupied by farm crops, is utilized as follows: alfalfa (lucerne) 30 acres; corn (maize) 25; wheat, 20; potatoes, 15; melons, 7; cabbage, cucumbers, onions, beets, etc. 8; household and waste 15.

The alfalfa is usually allowed to stand three to four years, after which the land is ploughed for corn and yields from 75 to 90 bushels of corn per acre.

Wheat has yielded only about 15 bushels per acre and is not considered profitable. It has only been retained in the rotation as a means of securing alfalfa. Potatoes produce a larger amount of gross income than is secured from any other one crop on the farm. Crimson clover and rye are sown after the potatoes have been harvested. The rye is manured during the winter, using from 10 to 12 tons per acre and is turned under in the spring after it has made a good growth. The melon crop has been a profitable one in the past; but for three years it has been damaged by an attack of a small larva which burrows in the root, and causes the plant to die. Experience in former years with this larva, has caused to be taken out what is termed "mutual insurance"; *i.e.* after the melons are planted, two rows of late cabbage are planted between each two rows of melons. These are to be removed if the melons escape destruction. The practice of raising two and in some cases three crops on the same land each year is a distinguishing feature in the management of this farm. In this way the area devoted to the garden crops is more than doubled.

So far as possible all crops are marketed direct from the field. Alfalfa hay is sold at $12 per ton delivered loose from the field. The shrinkage on alfalfa hay between harvest and January under ordinary storage conditions has been ascertained to be about

At 5 %	$	288
Labour	»	1 084
Manure	»	225
Commercial fertilizers	»	270
Five per cent depreciation on machinery	»	175
Repairs on machinery	»	160
Taxes	»	40
Seeds	»	70
Insurance	»	5
Total expense	$	3 517
Net returns from the farm	$	3 315
		6 832

No household account is kept, so that the surplus over the cost of living is not obtainable. The tenant considers his time worth $8 per day.

This would amount to a salary of $2 500 per year and would still leave him a confortable balance of $875 for a sinking fund.

The splendid success achieved on this farm is, as is nearly always the case, largely attribuable to the personality of the man.

If we were to measure his success on a percentage basis we would make it:

Individuality of the manager	75 %
Advantageous location of farm	15 %
Land	10 %

562 Ellis, L. W. **A Study of Farm Equipment in Ohio.** — *Ohio Agric. Exp. Station: Bulletin 227*, pp. 203-253. Wooster, Ohio, 1911.

United States: Ohio

This Bulletin presents the results of a study of farm equipment under the joint auspices of the Office of Farm Management of the U. S. Department of Agriculture and the department of cooperation of the Ohio Agricultural Experiment Station on a number of Ohio farms, where conditions were unusually favorable for obtaining information as to the proper relationship between investments in land, improvements, live stock, machinery, tools and other farm equipment.

Considerable data and a number of tables are presented illustrating the distribution of investments and showing the approximate cost and value of many items which serve to illustrate by concrete examples many of the factors to be taken into consideration in equipping farms.

Other tables show the average area and the volume of space devoted to live-stock enterprises, and the storage of products, machinery etc. in buildings, and the cost, value, and number of rods of fencing per acre on each of 21 successful farms.

As to distribution of acreage by entreprises it is shown for the group of 21 farms, with an average size of 165.88 acres that each has an average of 5.51 acres included in lots, lanes, waste spots, public roads, and other lands beloging to the farm which can not be properly charged to any other enterprise or group of enterprises; 2.04 acres in dooryard, family garden, and orchard, when not grown as a commercial proposition; 0.08 acres in tenant yards; gardens, etc.; 46.5 acres in lots, pastures, and fields devoted exclusively to live stock; 85.71 acres in tilled and mowed fields; 2.98 acres in permanent groves maintained largely for the production of maple sugar or syrup; 1.95 acres in fruit orchards largely commercial in their nature; and 21.11 acres in woodland. The mean average in crops is shown to be 52.8 per cent.

The first cost of equipping an average farm in Ohio is approximately as follows :

Land 165 acres at $ 46.25 (average) per acre	$ 7 676 42
Farm buildings	$ 2 700.—
Household buildings	$ 2 500.—
Fences	$ 763.74
Drainage	$ 366.43
Water supply	$ 225.—
Work animals	$ 640 71
Colts and driving horses	$ 250.95
Cattle	$ 582.26
Sheep	$ 201.05
Swine	$ 158.34
Poultry	$ 52.60
Bees	$ 3.23
Harness	$ 131.05
Machinery	$ 1 125.48
Minor articles	$ 200.00
Produce, supplies etc.	$ 631.93
Total . . .	$ 18 209.19

Of course, this applies only to farms equipped outright with new buildings, fences and machinery.

The average cost per acre per year of machinery, which is represented by the sum of depreciation, repairs, and interest, is shown to be as follows.

Walking plough	$ 0.072
Riding or gang plough	0 183
Spike harrow	0.019
Spring harrow	0 027
Disk harrow	0 049
Roller	0.020
Planker or drag	0 008
Weeder	0.033
Corn planter	0.081
Horse cultivator	0 043
2-or 3-horse cultivator	0.041
Corn binder	0.369
« Corn shocker »	0 842
Grain binder	0.264
Grain drill	0 130
Hay loader	0 248
Mowing machine	0 105
Hayrake	0 055
Tedder	0.164

568 PUGSLEY, C. W. **Cost of Growing Crops in Nebraska.** (*Nebraska Sta. Bull.* 122, pp. 3-12). *E. S. R*, Vol. XXV, No. 7, pp. 690. Washington, 1911

United States: Nebraska

The data reported in this Bulletin were secured by correspondence with a large number of farmers in various parts of the State and are given as an indication of the cost of production of the most common farm crops on an average Nebraska general purpose farm.

The following table summarizes data as to the average cost of growing corn, wheat, oats, wild hay, clover, and alfalfa, including interest and taxes and the time for men and teams while in the field, but not including marketing.

Average cost of producing various field crops in Nebraska.

Kind of Crop	Yield per acre	Cost per acre (1)	Cost per bushel or per ton (1)
Corn	39.30 bush.(1)	$ 11.63	$ 0.296
Wheat	22.20 »	» 11.19	» 0.549
Oats	35.00 »	» 11.39	» 0.325
Wild hay	1.25 tons	» 6.72	» 5.370
Clover	2.04 »	» 8.54	» 4.180
Alfalfa	3.33 »	» 10.33	» 3.100

The two greatest factors influencing the cost per bushel or per ton were the price of land and the yield per acre. At the average market prices the most profitable crops considered were wheat, corn and alfalfa.

FRASER, W. J. **To simplify Methods of determining the Profit or Loss of Milk Cows on the Farm.** — *U. S. Dept. of Agric.: Farmers' Bulletin No. 469. Experiment Station Work*, LXVI, pp. 1-24. Washington, 1911. 584

United States

In order to simplify methods of determining the value of individual cows, W. J. Fraser, of the Illinois Station, has prepared a table which is based on the findings of the department of dairy husbandry at that Station for the past 15 years. By means of this table, and knowing the annual milk yield, the profit or loss of any cow can be easily estimated.

Economic conditions are not the same in different parts of the United States and while the figures given apply especially to the Central West, the same should be found applicable to the entire country. In the eastern part of the United States feed is higher but the value of the product is also greater, while in the West the cost of keep will be less than in Illinois but the receipts for the product will also be less.

The price for the product is considered at the market value of butter fat at the creamery, and this price should be obtained by any dairyman in the State, no matter what his location.

The production per cow is the average for six years — the length of time cows are milked in most herds

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(1) The United States dollar = 49.32 pence ; U. S bushel = 0.9692 imperial bushel; ton = 2000 lbs. $1 per U. S. bu. = 4*s* 2*d* per imp. bu.; $1 per short ton = 4*s* 7 1/4 *d* per long ton. (*Ed*).

The value of the cows producing the different yields is estimated as nearly as possible at their actual market price. Cows producing 2 000 pounds of milk are valued at $ 30 and their value increases $ 5 for every additional 1 000 pounds produced up to 6 000 pounds, above this $ 10 for every 1 000 pounds increase in production.

The value of cows when disposed of is estimated at $ 30 for cows producing 2 000 pounds of milk, and this price decreases to $ 25 for cows giving 5 000 pounds of milk and above.

The amount of skim milk is figured as 85 per cent of the whole milk.

Skim milk is valued at 20 cents per hundred pounds, since the best data show that it requires an average of 5 pounds of skim milk to equal 1 pound of grain in pork production.

Calves from cows producing less than 5 000 pounds of milk annually are considered at veal prices only and are valued at $ 3 when 5 days old, when the milk of the dam is fit for use. From cows producing more than 5 000 pounds of milk annually the value of the heifer calves increases more rapidly, as the dams are more efficient producers. Bull calves are not considered of value except for veal, unless they are from cows producing an average of 10 000 pounds of milk annually, in which case their value is placed at $ 16, and this value increases at the same rate as the heifers from higher producing dams.

The manure is figured at 11 tons per head for cows producing 8 000 pounds of milk. On the 20 acre farm at the University last year cows which were kept in the barn during the winter and in a dry lot during the summer produced 13 tons of manure per cow. The average value is considered at $ 1.50 per ton.

At the Illinois Agricultural Experiment Station, on a three year rotation of corn, oats, and clover, manure has increased the crop yield $ 1.60 for each ton of manure used, figuring the market value of the crops, for the first three years after it is applied. No consideration is taken of the increased production from the effects of the manure after the first three years.

At the Ohio Experiment Station the value of the crop yields has been increased $ 2.34 for each ton of manure used. From the figures above stated, $ 1.50 a ton is a conservative value on cow manure which has been well cared for. Cows which produce less than 8 000 pounds of milk will produce, on the average, less than 11 tons of manure. The value of manure is lowered 50 cents per cow for every 1 000 pounds decrease in production of milk below 8 000 pounds, and raised 50 cents per 1 000 pounds increase in production above 8 000 pounds.

The labor per cow at the dairy of the University of Illinois has amounted to $ 22, where the cows were stabled continuously throughout the year. This is more, decidedly, than it will cost under the ordinary farmer's conditions; hence $ 20 is taken as a basis for labor on cows producing 8 000 pounds of milk annually.

The labor for cows producing less than 8 000 pounds of milk will not be materially less, as feeding, watering, cleaning stables, and caring for the individual cows will be practically the same, regardless of their production. The labor is reduced only 50 cents for every 1 000 pounds decrease in milk production below 8 000 pounds, making a minimum cost on a cow producing 2 000 pounds of milk $ 17.

With increased production, only a small amount of extra labor is required in caring for the cows and $ 1 is added to the cost of labor for each 1 000 pounds increase in yield.

The average barn for a herd of 40 cows is worth $ 2 000, or $ 50 per cow. The interest on this per cow would amount to $ 2.50 a year, and taxes, insurance, repairs, and depreciation will amount to $ 1.50 a year, making a total cost per cow for buildings and their maintenance of $ 4 a year.

The total annual expense of keeping a good pure-bred sire, including feed, care, and depreciation, is $ 75. In a herd of 40 cows $ 2 per cow must be allowed annually to have each calf sired by a pure bred. Spraying materials, medicine and veterinary service are estimated at 10 cents per 1 000 pounds of milk produced. An allowance of 5 cents per 1 000 pounds of milk produced is made for dairy utensils, since the cost of these will depend somewhat upon the amount of milk handled.

To obtain the final results of profit or loss per cow, the milk, to be as near the average for all breeds as possible, is considered to contain 4 % butter fat, which is the average of the 1 200 cows tested by the Illinois Experiment Station. In applying the table to a herd, computations for each individual cow must be made, depending upon the total amount of butter fat in her milk.

The value of the butter fat is based upon the Elgin prices for butter during the years 1907 and 1908 which averaged slightly above 27 cents per lb. The overrun, which is the amount of butter made above the amount of butter fat, is allowed for the expense of making the butter.

The cost of feed per cow is based on the prices of feed for the past two years, which is decidedly higher than formerly. The cost of feed is raised $ 2 for each 1 000 pounds increase in production of milk.

This increase is based upon a large number of yearly records kept at the University of Illinois where an accurate account is kept of all feed consumed and milk and butter fat produced for the entire year, on cows that vary in production from 2 000 to 15 000 pounds of milk annually. The table may safely be used as an index to profits; the figures are based upon definite data worked out at the experiment station, but the results will fluctuate slightly, according to the way the herds are fed. The price of feed varies in different years, but as a rule the price of the product varies with the feed, so that this fluctuation is small.

When a dairyman uses this table, the question is not whether the results obtained are absolutely correct to a few cents, as it makes no special difference to a farmer whether a cow brought in a profit of $ 10 or $ 10.50, but it does make an enormous difference whether she lost him $ 5 or made him $ 20, as may be easily done by ordinary cows producing within the range of many cows in the average herd.

AGRICULTURAL INDUSTRIES

INDUSTRIES DEPENDING ON ANIMAL PRODUCTS

MARCAS, L. M. and HUYGE, M. C. **Alterations in Milk after Milking.** (Altérations du Lait postérieures à la Traite). — *L'Industrie Laitière*, 37ᵉ Année, No. 3, pp. 40-42. Paris, 21 Janvier 1912. 565

France

In order to determine the frequency of the presence of ammonia in commercial milk, the writers examined 38 samples of milk, taken from different Belgian towns. In 11 samples no trace of ammonia was found; in 8 the reaction was weak, in 10 it was strong, and in 9 it was very strong. The chemical analysis of these samples showed that non-watered milk may contain ammonia, as well as watered.

Further, forty samples of milk taken from healthy cows, with every attention paid to cleanliness, showed not the least trace of ammonia, even when spontaneons coagulation set in.

The presence of ammonia in pure, *i.e.*, non-watered, milk, may be attributed to two causes·

1. Improper conditions of milking, such as bring about contamination by ammonia-producing organisms. In this case the milk only shows an ammoniacal reaction after being kept for a certain time. The ammonia is produced by the organisms decomposing the albumen, and hence the reaction increases with the age of the milk.

2. If milk just obtained contains ammonia, the reason must be sought in the absorption by the milk of the ammonia in the

atmosphere of the stall. This happens especially in the morning through insufficient ventilation during the night. In a stall of 506 cub. m. (17 870 cub. ft.), containing 15 animals, the writers found on an average 340 mgm. of ammonia per cub. metre, although the stall was well ventilated night and day. Here the fresh milk gave no ammoniacal reaction, but after 15 minutes it showed a slight, and after 45 minutes a strong reaction. The milk should therefore be removed from the stall immediately after milking.

506 TILLMANNS, Dr. F. **Rapid Preliminary Test of Milk for Water Adulteration** (Schnell auszuführende Vorprüfung der Milch auf Wasserzusatz). — *Molkerei-Zeitung, Berlin* 22. Jahrgang, No. 4, pp. 39-40. Berlin, 27. Januar 1912.

Germany

The Author, during his work in the Municipal Hygienic Institute at Frankfort-on-Main, has found a simple method, which, by the use of nitric acid, indicates with fair reliability any addition of water to the milk. He prepares a diphenylamin reagent in the following way · 0.085 gm. of diphenylamin are placed in a measuring jar of 500 cc. capacity, and 190 cc. of diluted sulphuric acid (1: 3) poured onto it, to this, concentrated sulphuric acid (S. G. 1.84) is added, and the whole is shaken; heating follows, and the diphenylamin dissolves.

The tube is then filled almost to the mark (500 cc.) with concentrated sulphuric acid and allowed to cool. After cooling, it is made up to 500 cc. with more sulphuric acid, the whole thoroughly mixed and preserved in a well stoppered bottle. The preparation will keep almost indefinitely. For its manufacture, sulphuric acid free from nitric acid (prepared on the catalytic method) must be used, and distilled water free from nitric acid must be employed; this water can be prepared by adding a little caustic soda solution before distilling.

The milk test is carried out as follows · 5 cc. of milk are put into an agitating flask, and 15-20 cc. of diphenylamin reagent poured on; the whole is well shaken, and the resulting tint observed.

The following list indicates the different colour reactions taking place with different contents of nitric acid.

Contents of nitric acid per litre of milk	Colour of Mixture.
Non-nitric milk	Whitish turbid immediately after shaking up, pink to yellow-red in 3 - 5 minutes.
1-2 mgm.	No clearly perceptible difference as compared with milk free from nitric acid.
3 mgm.	1 - 2 minutes after shaking up, a distinct green tint which passes into a pale yellowish green to yellow within 5 minutes.
4 mgm.	Very soon after shaking up, a green colour appears, reaching its maximum in about 3 minutes, but already exhibiting a shade of yellow. This shade becomes gradually more distinct.
5-10-20 mgm.	Immediate and continually growing green colour; strongly fluorescent, with bluish tint in case of large contents of nitric acid.

The reaction is a genuine diphenylamin one according to the Author. He considers his method extremely well adapted for preliminary test of milk for *rapidly sorting different suspicious specimens*, and he thinks that the Police, Dairies and other institutions may advantageously employ this simple test with a view to subsequently subjecting he milk found suspect to a more thorough examination in a laboratory.

It cannot be gainsaid that very small quantities (1-2 mgm.) of nitric acid in the milk give no distinct reaction, because so small a quantity may have resulted merely from the rinsing of the vessels. On the other hand it need not be apprehended that the water used for adulteration contains too little nitric acid. When water is added to milk it is mostly well water in country places, and this water is almost always very rich in nitric acid.

INDUSTRIES DEPENDING ON PLANT PRODUCTS.

COVENTRY, B. **The Present Position of the Indian Sugar Industry with some Suggestions for its Improvement.** — *The International Sugar Journal*, No. 157, pp. 30-31. Manchester, January 1912. 587

The continual increase in the amount of foreign white sugar imported into India at a low price, has caused a diminution in **British Indi** the area under sugar-cane and in the number of factories and refineries in the principal sugar-producing districts.

The amount of sugar imported, which never rose above 79 638 tons in the five years previous to 1889, now reaches 700 000 tons per annum.

The attention of the Government has been called to this matter, and the gravity of the situation was pointed out at the Agricultural Congress at Allahabad. A Congress is being held at Pusa, for the purpose of considering the situation and its improvement. The question is one of especial interest to the United Provinces, where half the sugar-cane grown in India is cultivated; the other Provinces can replace sugar by different crops.

The problem of sugar production in India is one of much complexity. While in other countries, the sugar producers aim at obtaining the maximum amount of sucrose (white crystallizable sugar), in India, on the contrary, the chief industry is the production of " Gur ", a mixture of crystallizable and uncrystallizable sugar.

The defects which exist in the Indian sugar industry are due to wrong and wasteful methods in manufacture, and to imperfect cultivation.

Among the defects in manufacture (mechanical) may be mentioned, in extraction due to low efficiency of the mills, imperfect methods of concentration, and wasteful and antiquated means of separating the molasses from the sugar.

While in other countries the usual crop is 30-40 tons of stripped cane per acre, in India 15 tons per acre is considered a good yield.

It has been recommended that a breeding station should be set up, preferably at Madras, which is the most favourable locality for the raising of new varieties from seed.

568 **Composition of the Wines of Chile.** (1) (Los Vinos en la Esposicion Nacional de Agricultura, Santiago, 1910. Le acidez ¡Volátil en los vinos). — *Boletin de la Estación enológica de Chile*, No. 6, pp. 9-23; 24-31. Santiago de Chile, 1911.

Chile On the occasion of the National Exhibition of Agriculture and Industry, which took place at Santiago at the end of 1910, the oenological station of that town made a collection of all the wines on view. Of these the best were analysed. The figures obtained were arranged in tables, and the wines of each district grouped together.

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(1) For further information on this subject see: GASTON CANU *Contribucion al estudio de los vinos chilenos. Boletin de la Estación enológica de Chile*, pp. 3-59. Santiago de Chile, 1910; *Estudios sobre los mostos*, 1910; *ibid.* pp. 65-104. (*Ed.*).

As a rule the alcohol percentage of the wines analysed varied from 10.5 to 12 degrees, and high grade white wines with a large percentage of alcohol and well balanced ingredients are chiefly produced in the Department of Maipo. In many of the samples the ratio of alcohol to dry extract exceeded the maximum figures laid down by Ganthier (4.6 for red wines, and 6.5 for white wines); and this applies specially to the wines of the Lontué district.

The total acidity is low, and often does not reach 4 gr. per litre (4 per 1000). The wines of the Lontué district are also noted for the small quantity of fixed acids that they contain.

As a rule the wines have proved themselves wholesome, the maximum quantity of volatile acid in the dry wines being found not to exceed 1.86; while 40 % of the wines contained of volatile acid less than 1 gr. per litre, and 74 % contained less than 1.25.

It has been noticed that the volatile acid of new Chilian wines averages, three months after the vintage, from 0.50 to 0.60 gr. per litre.

The ash is usually normal in quantity. The wines of 1911 were in comparison with those of the two preceding years, richer in potassium sulphate, a fact which shows that the practice of treating the must with sulphurous acid and with calcium sulphate is considerably extending.

In 84 % of the wines the alcohol *plus* the acidity exceeds 14.5 — which proves the quality of the product.

PARIS, G. **Grape Pips** (1). (I Vinaccioli). — *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLIV, fasc. 8-9, pp. 669-727. Modena, 1911. **569**

Ital

The revival of the industry of extracting oil from grape pips (an industry which is beginning to spread in Venetia and Apulia where it yields the best economic results) has given a more practical value to researches capable of simplifying the process.

A secondary industry has sprung into being by which the residues of wine-making can be turned to account.

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(1) See also: *B.* June 1911, No. 1866; July 1911, No. 2251; and OTTAVI-MARESCALCHI: *I residui della vinificazione*, Casale, 1901.

(*Ed*).

Grape pips which have hitherto been regarded from the point of view of vine reproduction and the manufacture of tannin, are now considered as the source of an oily matter, the extraction of which does not make the residue unfit for fodder, fuel or even manure.

This secondary product can therefore be completely utilised and all that is of agricultural value can be extracted.

To realize the importance of this industry, it should be remembered that the fresh residuum of pressed grapes contains 15-20 % of pips.

Each hectolitre of wine represents about 16 kg. (*i.e.* 16 %) of dry exhausted residuum capable of yielding 2.5 kg. (2.5 %) of grape pips.

Taking as a basis the average wine-production in Italy, from 60 million hl. (1320 million gals.) of wine, about 180 000 qls. (17712 tons) of oil might be produced, reckoning the amount of oil which corresponds to one hectolitre of wine at 300 gm. (= 0.3 %).

At the present time, when the need for fatty matters increases daily and still more the tendency to the utilization of by-products, such figures should not be neglected.

The articles by Ciapetti and Marre give interesting information concerning the technique of the extraction of oil from grape-pips. Ottavi and Marescalchi also, so long ago as 1901, devoted to this subject some pages of their hand-book dealing with the "Residues of Wine-Making" (*I residui della vinificazione*). The writer has now brought out a monograph dealing in an exhaustive manner with the technique and chemical side of the matter and treating from a chemical standpoint the nature of the fatty matters extracted, that of the ash of the grape pips, the carbohydrates, and the tannic and proteinic substances.

The results give the most complete information concerning the structure of the pips.

The following are the data resulting from analyses made by the Author of numerous samples of air-dried grape-pips:

Weight of a bushel	38.4 lb.
Water	8.99 — 11.95 %
Crude fat	13.73 — 19.51 »
Saccharifiable carbohydrates calculated as starch	9.37 — 11.66 »
Crude ash	2.51 — 3.72 »
Crude protein	9.83 - 11.26 »

Grape-pip oil is already much used in soap-making; it can be employed as a lubricant, an illuminant and, after careful purifying, for table purposes.

The technique of its extraction is that used in the case of all similar oils.

The oil is obtained according to the economic condition obtaining, either by crushing and pressure, or by the action of solvents. When purified and clarified, it is dark yellow and without smell. It becomes rancid on exposure to air, but if well kept this alteration does not take place so easily as is supposed.

From its iodine index it belongs to the drying oils.

Its constants are as follows:

Specific gravity at 15°C.	0.9502
Acidity	16.8
Saponification value	179.8
Iodine »	96 00
Acetyl »	143.1

Grape-pip oil before refining is worth 60 fr. per ql. (23*s* 9*d* per cwt.) and after refining 80 fr. (31*s* 8*d* per cwt.).

If mechanical extraction yields a better product and is preferable for the reasons given later, the method of extraction by means of solvents has great advantages also, which perhaps render it preferable. Some of these are the greater amount of the product (which however cannot be used in soap-making), a larger yield of oil by the grape-pips which have been distilled than by those that have not been submitted to this process ; and lastly the possibility of selling with advantage the remaining pips to large factories which centralize this industry.

The oil-factories which treat the olive pomace with solvents buy dried grape-pips at 3 fr. per ql. (24*s* a ton.).

As solvents, the following substances are used: carbon disulphide, benzine and carbon tetrachloride; the latter has the advantage, among others, of not being inflammable and of leaving oil cake, which can be given to cattle without harmful results.

The technique of the extraction of this oil is that used in the case of other oleaginous seeds.

The cakes of grape-pips, which have undergone mechanical extraction, or been submitted to the action of benzine or tetrachloride, can well be used as a feed, especially if treated with molasses, or with the addition of other more concentrated nutritive substances.

In order to obtain a feed with albuminoid ratio of 1 : 6 suitable for draught cattle and milch cows, it is sufficient to add to each part by weight of grape-pip oil cake 0.65 part of bran. With molasses feeds, the writer obtained excellent results by the addition of 50 parts of molasses to 100 parts of crushed cake. This gives a feed which, from its low cost, and its well-balanced nutritive constituents, would be very useful for draught or fatting cattle.

As a rule, cakes of grape pips are used as fuel, especially those which result from carbon disulphide extraction.

Their calorific power exceeds 4450 calories, approaching more nearly that of lignite than of peat.

Finally, the ash, of which the average proportion is 3 %, as we have seen, is sold at 2 fr. 50 per quintal (20s a ton.) and is generally used in soap factories.

It also makes an excellent manure, since the chief components of 100 parts of crude ash are

Lime	28 67
Phosphorus pentoxide	22 93
Potash	21 52

Thus the by-product of wine-mahing is almost completely utilized and, for this reason, has a great economic importance.

570 **Hoepfner, P. The Future Importance of Lupin Cultivation on Light Soils in Connection with the Manufacture of Lupin Flakes.** (Die künftige Bedeutung des Lupinenbaues auf leichtem Boden bei Herstellung von Lupinenflocken). — *Illustrierte Landwirtschaftliche Zeitung*, 32. Jahrgang, No. 6, pp. 38-39. Berlin, 20. Januar 1912.

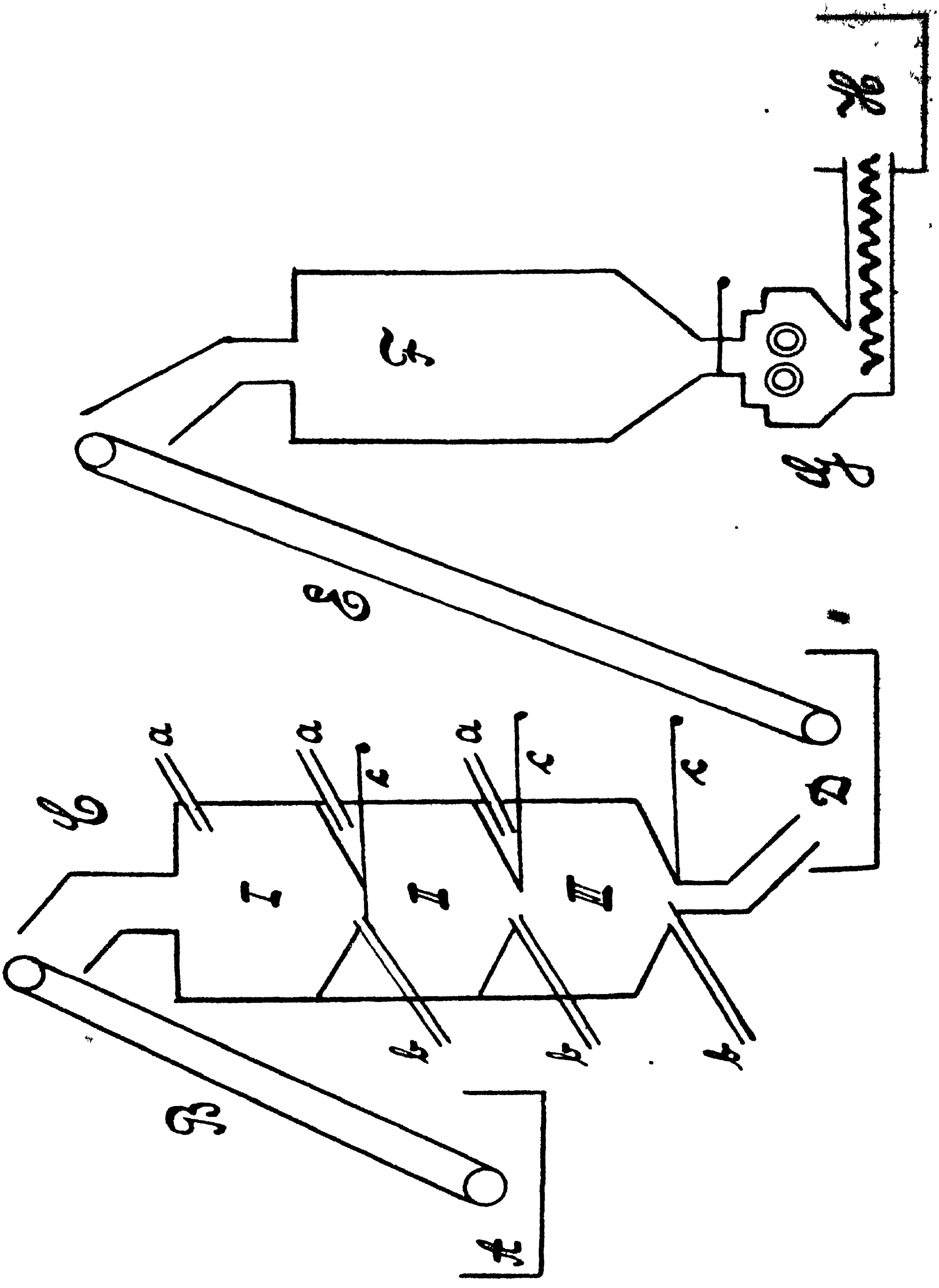
Lupin as a fodder plant acquires constantly growing importance with the manufacture of its grains into lupin flakes.

Germany

An appliance is now constructed having for its object the manufacture of lupin flakes on a large scale. The raw lupin grains are put into a box A and from here are conveyed by an elevator B into the eliminator C where they are disembittered; this eliminator has three divisions, I II & III. Each division has a water inlet and outflow tube *aa* and *bb*. In the bottom of each division a hole is also provided for discharging the lupins; this hole can be closed by a slide *c*. In each division of the eliminator an inspection glass is fitted for checking purposes. The lupins are transported into division I and remain here for 24 hours, after which they pass into division II and then, after another stay of 24 hours here, enter division III; from the latter, a day later, they are transferred to the box D. Each division of the eliminator is filled with water when the lupins are inside; the water can be renewed as often as required; it should not be too warm because otherwise nutritious material is extracted. Before the lupins are discharged into the next division the water should be run off. The empty divisions are immediately refilled with lupins, so that from the fourth day onwards division III can be emptied every day. The lupins, after passing through the eliminator enter a box D and are from here conveyed by an elevator E into the Henze steamer F where they are steamed. It is as well to put some potatoes into the steamer at the same time; the lupins can then more easily be made into flakes; 100 kilogrammes of potatoes and 500 kilogrammes of lupins should be the most suitable ratio.

The steamed lupins pass into the dryer G, where they are worked up into flakes. The finished flakes are carried by a conveyor worm into a box H.

Lupin flakes contain about 36 % of digestible protein, 3.2 % of fat, 28-29 % of carbohydrates, 15.5 % of crude fibre and in addition about 11 % of water and a small percentage of ash. They can be used as horse and cattle fodder but are best mixed with other concentrated food; at the beginning the ratio should not be too high until the animals have got used to the fodder. Lupin flakes may also be advantageously employed as fish food.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PLANT DISEASES.

GENERAL INFORMATION

STATIONS FOR PLANT PATHOLOGY AND AGRICULTURAL ENTOMOLOGY.

VERMOESEN. **The Plant and Seed Fumigation Station at Colombo, Ceylon.** (La station de fumigation des Plantes et des Graines, de Colombo, Ceylan). — *Bulletin agricole du Congo Belge*, vol. II, No. 4, pp. 718-722, fig. 333-335. Bruxelles, Décembre 1911. **571**

This Station was created with the object of preventing the importation into Ceylon of insects and fungi which might cause damage to the plantations in the island.

Ceylon

The Governor is vested with the power to enact all necessary measures. Consequently it is prohibited to import into the island the seeds and plants specified below through other ports than Colombo, and they will be subjected to immediate fumigation : tea seeds from India, cotton seeds, bulbs, roots and living plants of every description (except pulse intended for consumption), oranges and generally all citrus fruits.

On arrival of the goods at the port, the consignee is bound to declare the nature of the contents of the packages.

The Station, which is very simple in construction and is situate near the Custom house, consists of three rooms. The first is used as an office, the second is " the large fumigation room ", communicating with the outside through an airtight door, and the third is " the small fumigation room ", half the size of the last named.

Wooden frames support a number of drawers intended to receive the material to be disinfected; the number of these drawers can be increased in case of need.

The two rooms together suffice to disinfect 4100 kg. (80 cwt.) of tea seed in one operation.

An airtight barrel of a capacity of about 150 litres (5.3 cub. ft.) is used for treating small quantities of seed.

Tea seeds are treated with formol; other seeds and plants generally are fumigated with hydrocyanic acid, according to the formal instructions which are posted up inside the Station.

The disinfecting operations are gratuitous, and are carried out by a single officer of the Custom house staff, who likewise keeps the registers of the plants and seeds entering and leaving the Station.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

572 PANTANELLI, E. **The Vine Roncet.** (1) (Beiträge zur Kenntnis der Roncetkrankheit oder Krautern der Rebe). — *Zeitschrift für Pflanzenkrankheiten*, XXI Bd., Heft 2, S. 1-38, 29 Fig. Stuttgart, 20 Januar 1912.

Italy

After a historical summary of our present knowledge of this still ill-defined disease of the vine, the Author gives the result of his own morphological, anatomical and physiological enquiries directed to elucidating the true nature of the roncet. The last series of enquiries renders it evident that in the diseased plants serious disturbances of the assimilative activity of the green parts and metabolism takes place, which leads to the accumulation in the wood of the abnormal reserves formed. The abnormal composition of the ash and the derangements noted in the movement of the sap point to abnormal activity of the roots of the vines attacked by roncet.

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(1) See *B.* June 1911, No. 1883 (*Ed.*).

578

RIVIÈRE, GUSTAVE and BAILHACHE, GABRIEL. **Remedial Measures against Chlorosis in Fruit Trees.** (1). (La lutte contre la chlorose des arbres fruitiers). — *Journal de la Société nationale d'Horticulture de France*, 4e série, tome XII, pp. 649-653. Paris, Décembre 1911.

France

The Authors have undertaken a series of experiments on treatment of chlorosis in fruit trees. For this purpose, instead of using, as hitherto, powdered ferrous sulphate introduced in big doses into a cavity made in the bottom of the trunk or the large branches of the chlorotic trees, they made use of citro-ammoniacal pyrophosphate of iron in a solution of a strength of 0.050 gr. per litre (= 005 %).

The Authors proceeded as follows in their experiments: In the trunk, about 4 in. below the fork they hollowed out a cylindrical cavity horizontally as far as the pith, and closed it with a piece of cork through which passed a narrow glass tube. This tube, at first horizontal, is bent upwards, and its terminal part is so shaped as to serve both as a reservoir and as a funnel for the experimental liquid. When the apparatus is full and ready to work, the liquid column reaches a height of about 3 ft.

The trees subjected to experiment were pears of the varieties " Doyenné de juillet ", " Passe-Crassane ", " Beurré Hardy ", " Beurré Damanlis " and " Doyenné de Comice ".

The fairly satisfactory results obtained led the Authors to the conclusion that citro-ammoniacal pyrophosphate of iron used under the conditions set out does not form any precipitate with tannins, readily diffuses through the ligneous tissue and is consequently one of the salts of iron to be preferred for effectively dealing with chlorosis in fruit trees.

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(1) See *B*. Jan. 1912, No 223 (*Ed.*).

BACTERIAL AND FUNGOID DISEASES

FUNGOID DISEASES.

574 COLLINGE, WALTER E. **Root and Stem Rot** (***Rhizoctonia violacea* Tul.**). — *Second Report on Economic Biology*, pp. 46-47. Birmingham, 1912.

Great Britain

In June last (1911) a serious outbreak of this disease on upwards of ninety acres of potatoes was inspected in Staffordshire.

The disease is due to a fungus that appears under many forms and names, and attacks a great variety of plants, *e. g.* potatoes, asparagus, beet, bean, carrot, cabbage, cauliflower, clover, lettuce, lucerne, mangels, radish, pea, tomato and a variety of bulbous plants and weeds; it does not touch cereals.

Although the mycelium behaves in a slightly different manner, and presents a modified appearance when growing on different hosts, infection experiments have proved that it in every case belonged to one and the same species.

The fungus lives in the soil, but, so far as is known at present, it never fruits; it is spread and propagated by the formation of little concentrated masses of mycelium. These may be very small and attached to the surface of the tuber, or they may be as large as a pear and remain in the soil, free from the roots, and serve as centres of future infection.

In some cases, little injury is done to the potatoes, in others the stems and tubers rot and very serious losses ensue. Usually the disease spreads over a wider area each year.

There are some points in connection with the life-history and habits of these fungi which at once point to a remedy, *viz*.

1. They are unable to develop excepting in the presence of an acid.

2. They flourish best in sour, badly drained, and poorly aerated soils.

3. As the fungus makes use of weeds as food, when a cereal crop is on the land, it is advisable to keep these down.

4. All diseased haulms or tubers should be burnt.

5. Liberal applications of ground unslaked lime will destroy the fungus and sweeten the soil.

6. The cessation of all acid manures is advisable.

7. All purchased seed should be obtained from dry, elevated districts and should be carefully examined to see that it is free from the small sclerotia or concentrated masses of mycelium.

FOËX, ET. **Note on the Modes of Hibernation of the Vine Oidium.** (1). (Notes sur les modes d'hibernation de l'Oïdium de la Vigne). — *Le Progrès agricole et viticole,* 33^e^ année, No. 2, pp. 47-51. Montpellier, 14 Janvier 1912. **575**

France

The Author mentions that as it is almost proved that the oidium of the vine has lived for a long time in Europe in the absence of perithecia (*Uncinula necator*), and that in certain countries it is still maintained under these primitive conditions, the oidium itself must possess other forms of hibernation than the perithecia.

The Author adds that in the buds of the vine he found neither the mycelium of *U. necator,* which, according to Viala, Wortmann, Istvanffi and Ravaz, ensures the perpetuation of the parasite, nor the conidia fixed in the angles of the August shoots, which, according to De Bary and Viala, play the same part as the mycelium.

On the basis of his own investigations the Author concludes that the question of the modes of hibernation of the vine oidium still remains very obscure.

ARNAUD. G. and FOEX, ET. **On the Form of the Oak Mildew in France.** (Sur la forme de l'Oidium du Chêne en France). — *Comptes rendus hebdomadaires des séances de l'Academie des Sciences,* Tome 154, No. 3, pp. 124-127. Paris, 15 Janvier 1912. **576**

France

For the last few years an *Oidium* (1), not accompanied by the perfect form (perithecia) has been growing in abundance on oaks. This form was, however, found on the 30th December 1911 at

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(1) See *B* Feb. 1911, No. 603; March 1911, No. 990; and June 1911, Nos. 1891-1893. (*Ed.*).

(1) See *B*. Nov. 1910, pp. 167 ; Dec. 1910, pp. 365 and 370; Jan. 1911, No. 331; March 1911, No. 998; April 1911, No. 1298; and June 1911, No. 1892; (*Ed.*).

Cavillargnes (Gard) on *Quercus sessiliflora* Smith; the Authors consider that the perithecia examined belong to *Microsphaera quercina* (Schweinitz) Burrill, which has long been known as a parasite of oaks in North America. They state that *Microsphaera quercina* has long existed in Europe, but believe that the fungus, formely localised or rare, has considerably extended and developed under the influence of slight alterations of environment favourable to its evolution.

577 MÜLLER, KARL. **American Gooseberry Mildew and Oak Mildew in the Grand-Duchy of Baden.** (Zur Ausbreitungsgeschichte des amerikanischen Stachelbeermehltaus in Baden und einige Bemerkungen über den Eichenblattmehltau). — *Zeitschrift für Pflanzenkrankheiten*, XXI. Bd. Heft 8, S. 449-454, 1 Textfigur. Stuttgart, 30 Dezember 1911.

Germany: Grand-Duchy of Baden

According to the study made by the Author of the extent to which *Sphaerotheca mors-uvae*, discovered in 1908, has spread in the Grand-Duchy of Baden, it appears that in the central part of the Grand-Duchy there is a clearly localised centre of infection, and all the other infested points towards Freiburg, Neustadt, Marzell and Uberlingen must be regarded as sporadic centres. The infested gooseberry bushes come from North Germany.

The disease is only spread by the transfer from place to place of gooseberry bushes on the branches of which the ascospores of the fungus hibernate; the spread of the disease by conveyance of the conidia in summer by the wind is of local extent only.

With reference further to oak mildew, likewise reported for the first time in 1908 in the Grand-Duchy of Baden, the Author points out that this fungus also attacks beech (*Fagus silvatica*) in the Grand-Duchy.

578 ARNAUD, G. and LAFONT, F. **The Biology of *Nectria cinnabarina* and *Coryneum Mori*.** (Accidents météorologiques et maladies du Mûrier). — *Annales de l'Ecole nationale d'Agriculture de Montpellier*, nouvelle série, tome XI, fasc. III, pp. 169-215, fig. 1-25. Montpellier, Janvier 1912.

France. India. Japan

The Authors, at Montpellier, have studied the development on the mulberry of *Nectria cinnabarina*, which in some years causes considerable havoc. To the particulars regarding *N. cinnabarina* the Authors add facts concerning *Coryneum Mori* which occasionally attacks the mulberry, but only in India and Japan, these particulars being taken from a study by Butler. The growth of *Nectria* is probably, like that of *Coryneum*, connected with the action of spring frosts on the young buds in process of development. According to the Authors, the fungus makes its way into the branches through the frost-bitten buds.

Nectria seems to find entry into these buds during the rainy periods occurring from the middle of May to the end of June. Its growth requires a great deal of moisture; its injuries stop with the beginning of summer drought. The fungus which has penetrated a branch develops rapidly; its mycelium invades the external wood, the bast and the bark, the two latter portions being completely disorganised by the mycelium. The growth of the mycelium and the alteration of the tissues calls forth a reaction by the plant which forms thyloses in the vessels for some length. The cicatricial tissues thus formed prevent the rise of the sap towards the end of the branch, which withers and dies. Sometimes the mycelium, which may have a perennial life of several years, gradually makes its way down towards the base of the branch and invades the living tissue.

At the time when the end of the branch is completely withered the fungus has only extended its mycelium a length of about 10 cm. (4 inches); the rest is absolutely free from infection. If the outside bark is lifted the healthy green part is observed beneath, and then the brown attacked part. The bark of the dry end of the branch, is grey and dry inside. In the brown part the fructifications of the conidial form of *Nectria* are formed, known as *Tubercularia vulgaris*, the only ones observed on one year-old branches.

Later on, the second fruiting of the fungus takes place, known under the name of *N. cinnabarina*. The Authors have never observed it in the mature state on the mulberry.

According to the Authors, *Bacterium Mori*, *Gibberella pulicaris* and *Botrytis cinerea* have no connection with the disease under study.

As regards remedial measures, though the elimination of the parts attacked with the object of destroying the infecting germs is ineffective, this will not be the case when the operation is carried out with a view to preventing the parasite from going down from the parts attacked to the healthy parts. In cultivation on a large scale, the removal of the branches attacked is sufficiently secured by the usual pruning which is done every two years.

In nurseries not regularly pruned, when the disease rages, it is essential, in the autumn or in the following spring, to remove all the dead parts, and for greater safety, 10 to 20 cm. (4 to 10 inches) of the healthy part.

In countries subject to frost, over-early varieties of mulberry should also be got rid of.

The Authors likewise advise trying Bordeaux mixtures.

According to Butler, the means of dealing with *Coryneum Mori* consist in removing the parts affected as well as the dead or weak wood and burning the whole immediately, in order to get rid of the centres of production of the spores. Beyond this more careful pruning must be carried out, leaving perfectly clean cuts.

According to the Authors, the burning of the dead wood and the pruned wood does not ensure complete destruction of the fungal spores.

The removal of the diseased or weak branches will be effective in preventing the mycelium from attacking the branches still healthy

Butler has observed that the practice followed in Cashmere of distributing mulberry branches and not detached leaves to silkworms facilitates the propagation of the parasite, because the branches are cut roughly, regardless of the condition in which they leave the plant and the injuries caused. He adds that silk-worm rearing on this method offers no perceptible advantage over the method generally used in Europe, which consists in rearing the worms on detached leaves.

The Authors dispute this latter view of Butler, but they notwithstanding acknowledge the advantages presented by methodical and careful pruning from the point of view of production and crop of the leaves; finally, they urge, with the object of preventing the entry of other parasites (*Polyporus*, for instance), that care should be taken, in countries where worms are reared on whole branches, to trim the cuts after the first rough cutting.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS.

579 REED, HOWARD S. and COOLEY, J. S. ***Heterosporium variabile* Cke., its Relation to *Spinacia oleracea* and Environmental Factors.** — *Centralblatt für Bakteriologie, Parasitenkunde u. Infektionskrankheiten*, 32 Bd., No. 1-2, S. 40-58, 9 Fig. i. Text. Jena, 5 Dezember 1911.

Heterosporium variabile Cke. infests the spinach fields in Virginia.

United States: Virginia

From the Authors' investigations it appears that this fungus is an occasional parasite, and that it generally attacks spinach plants which are already suffering from and enfeebled by other pests.

Peronospora effusa Grev. found in some spinach plantations precedes the *Heterosporium* infection. The injuries caused by winter frost likewise predispose spinach to the disease.

In the detailed study of the growth of the fungus, the Authors have, *inter alia*, brought out the fact that *Heterosporium* acquires great variability of form and behaves differently according to the different physiological conditions. As soon as it is isolated, it grows with difficulty as a saprophyte, but, in the course of time, changing its shape and its behaviour while remaining a saprophyte, it develops luxuriant growth.

580 WRIGHT, R. PATRICK. **Report on an Experiment on the Prevention of "Finger-and- Toe" (*Plasmodiophora Brassicae*) (1) in Turnips. Conducted at the College Experiment Station 1903-1909.** — *Report of the West of Scotland Agric. College.* Glasgow, 1911.

Scotland

The experiment of which this report gives an account, was carried out on a field on the College Experiment Station, Holmes Farm, Kilmarnock.

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(1) See *B.* Nov. 1910, p. 162; Feb. 1911, No. 601; Aug.-Sept.-Oct., 1911, No. 2984. (*Ed.*).

The soil consists of a light loam in good condition, but poor in lime.

In 1901, a section of the field was sown with a crop of rape and the plants were found to be infected with "finger-and-toe" disease.

A series of small plots of $\frac{1}{400}$th part of an acre each were marked off in the following winter on the infected land, and a crop of turnip manured with superphosphate grown in 1912.

The crop was again badly attacked by the disease.

When the roots were raised in autumn, the diseased parts were carefully and uniformly spread over the land, so that the whole area intended for experiment should be completely and equally infected.

Various means were employed for the purpose of protecting succeeding turnip crops from the attacks of the fungus ·

(1) Ashes.
(2) 2 tons lime per acre.
(3) 4 » » » »
(4) 1 ton » » »
(5) Naturally slaked lime
(6) Ground lime.
(7) Spring v. autumn application of lime.
(8) Sulphate of copper.
(9) Kainit.

The following conclusion may be drawn from this experiment.

(1) The destruction of the turnip crop by finger- and- toe disease can, to a certain extent, be prevented by the application of suitable dressings of lime.

(2) On land much infected, dressings of lime of less than two tons per acre cannot be relied on to produce much effect.

(3) On land much infected, applications of four tons per acre are more successful, but will not entirely destroy the disease nor save the crop.

(4) Lime applied in the drills in spring is much less effective in preventing the disease than when put on the land in the preceding autumn.

(5) Small dressings of lime, applied either in autumn or in spring, have little effect.

(6) Lime slaked in small heaps by atmospheric moisture is distinctly less effective in preventing the disease than the same lime (CaO) slaked by pouring water over it when fresh from the kilns and spreading it on the land while it still remains in a caustic condition.

(7) Ground lime is more expensive and no more effective than an equal quantity of properly slaked lime.

(8) Sulphate of copper, applied at the rate of half a ton per acre, has no immediate effect in saving the turnip crop from the "finger-and-toe" attack, but is ultimately injurious to the disease fungus.

(9) Kainit applied in the same quantity in spring to the turnip crop has no effect in protecting it, but its subsequent action in the soil is detrimental to the "finger-and-toe" fungus and beneficial to succeeding turnip crops.

(10) Ashes, probably on account of the alkaline condition they produced in the soil, proved to be a complete preventive against "finger-and-toe" attack. A heavy dressing of coal ashes was used.

KUSANO, S. **On the Chloranthy of *Prunus Mume* caused by *Caeoma Makinoi.*** — *Journal of the College of Agriculture, Imperial University of Tokyo*, Vol. II, No. 6, pp. 287-326, Plate XVII-XVIII, 3 Text fig. Tokyo, April 25th, 1911. **581**

In the Botanical Garden of the College of Agriculture in Tokyo, the Author observed numerous specimens of *Prunus Mume* attacked by *Caeoma Makinoi.*

This fungus, living as a parasite on the flower buds, calls forth in the latter various anomalies connected with the phenomenon of chloranthy The protoplasm of organs not yet differentiated reacts to the stimulus of the mycelium, that is, it determines alterations in the development of these same organs. **Japan**

The appearance of chlorophyll, accompanied by other internal and external modifications of the flower organs, extends *pari passu* with the extension of the mycelium.

The anomalies are more deeply seated according as the fungus develops more vigorously on the host plant. If the bud is attacked by the parasite in the first stages of its development, it is converted into a branch, while chloranthy does not make its appearance or is incomplete if the growth of the bud is already far advanced. Before the phenomenon can appear in its entirety, the fungus must attack the bud at a perfectly definite moment of the latter's evolution.

Bud-rot, *Thielaviopsis ethacetica. Botryodiplodia* sp., and *Pestalozzia Palmarum,* Diseases of the Cocoanut. — See below, No. 598. **582**

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

583 TEUSCHER, A. **Dock (*Rumex Patientiae*) in Clover Fields.** — *La Terre Vaudoise*, 4e année, No. 4, pp. 43-44. Lausanne, 27 Janvier 1912.

Switzerland

At St. Urban, near Langenthal, a large clover field, formerly of luxuriant growth, has recently been very seriously invaded by docks (*Rumex Patientia*).

Besides taking up room at the expense of the clover, this plant is carefully shunned by cattle. Its seed retains its vitality and fructifies even after being kept in solid and liquid manure. After a lapse of four years, dug to a depth of 30 cm. in the soil, it still preserves its germinating power, so much so that it is very difficult to obtain clover seed free from *Rumex*.

To control this weed, its root must be completely exterminated. A very small shred of these roots, which successfully withstand sun, frost and ploughing in, suffices for the rapid propagation of the species. This is also contributed to by the circumstance that the Berne soils are highly nitrogenous and that rotation of crops is rather rare. In less fertilised soils the plant shows a less vigorous growth and is not so dangerous. Still, it is desirable to destroy at once the isolated roots of *Rumex*, in order to avoid having to deal with the weed when more widespread; but above all thorough care should be taken that clover seed contains no dock seeds; the latter may be easily recognised by their red colour and triangular shape, but they are at the same time difficult to separate from the good seed. Nevertheless, there are sorting machines which supply completely purified clover seed.

The propagation of dock may also be prevented by taking care not to throw on stable litter the coarse fodder remains left in the crib, and also by being careful to pull up the young dock plants when their roots are still straight. Finally, when clover is to be kept for seed, *Rumex* plants must be cut and removed from time to time.

INSECT PESTS

GENERALITIES.

584

GRANDORI, REMO Contribution to the Embryology and Biology of *Apanteles glomeratus* (L.) Reinh., a Parasite of the Larva of *Pieris Brassicae* L. (Contributo all'embriologia e alla biologia dell'*Apanteles glomeratus* (L.) Reinh. Imenottero parassita del bruco di *Pieris Brassicae* L.) — *Redia*, Vol. VII, fasc. II, pp. 363-427, tav. XIII-XVI. Firenze, 31 Dicembre 1911.

Italy

This is a study on the life history of *Apanteles glomeratus* (L). Reinh., Hymenoptera, which the Author found widely and equally distributed in the provinces of Rome, Pisa, Catania, Palermo and Padua, as a parasite of the larva of *Pieris Brassicae* L. (1).

585

COLLINGE, WALTER E. The Mangel or Beet Fly (*Pegomyia Betae* Curtis) (2). — *Second Report on Economic Biology*, pp 13-17. Birmingham, 1912.

Great Britain

For many years past, economic entomologists, farmers, and others have noticed the spread and increasing numbers of a small dipterous fly which, at the present time, is inflicting a very serious loss upon growers of mangels or beet.

Numerous suggestions have been put foward as to the control of this insect, but in spite of these, it has continued to increase and devastate annually a large acreage.

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(1) In addition to *P. Brassicae*, *Apanteles* is also a parasite of numerous other Lepidoptera: *Macroglossa stellatarum* L., *Notodonta Zic-zac* L., *Aporia Crataegi* L., *Smerinthus Populi* L., *Zygaena ephialtes* L., *Bembecia hylaeiformis* Lasp., *Abraxas grossulariata* L., *Phigalia pedaria* F., *Vanessa Urticae* L., See. GRANDI, G. *Dispense di Entomologia agraria*, p. 441. Portici, 1911. (*Ed.*).

(2) See *B.* April 1911, No. 1307; and June 1911, No. 1941. (*Ed.*)

Acting upon the suggestion of certain growers, the writer has made a thorough and detailed study of this insect in its various stages, and has carried out a number of experiments.

It appears to have first been noticed in this country in 1846.

Carpenter mentions that, in addition to the direct injury to the plants by the leaves, the former were possibly rendered liable to attack by the rot-fungus (*Phoma Betae*).

The species is generally distributed over the British Isles.

Allied species found on various weeds are frequently mistaken for it, as well as the celery fly (*Acidia Heraclei*).

Food Plants.

In addition to the beet and mangel, *Pegomyia Betae* is also found on species of dock, the goose foot (*Chenopodium album*), and sowthistles (*Sonchus arvensis* and *S. oleraceus*).

Life-History and Habits.

The eggs are deposited beneath the seed leaves and leaves.

On the former they usually occur singly or in pairs, very rarely in clusters; on the ordinary leaves, however, clusters of four to ten are common.

In colour the egg is white; it is elongated, oval and characteristically marked. The length is about 1 mm.

On hatching, the young larvae at once commence to make their way into the mesophyll of the leaf.

There are probably four moults; the full-grown larva measures from 8-10 mm. in length.

The puparium is usually found in the soil an inch or so beneath the surface, but occasionally it is seen within the leaf blisters.

Two or three broods appear in the year.

The pupae of the last brood remain in the soil during the winter; occasionally, however, they develop and hibernate.

As winged insects, most die before the winter sets in, but hibernation is by no means uncommon.

Remedial Measures.

Wherever there has been an attack of this insect, the land should be treated with ground unslaked lime, 15 cwt per acre, and deeply turned in.

Various fluids have been tried to prevent the flies laying their eggs on plants. The following has proved the most effective:

Paraffin	1 gall
Soft Soap	½ lb.
Ammonia	4 oz.
Water	10 gall.

This should be sprayed on the plants towards the end of May.

Top-dressing with nitrate of soda and common salt has also proved valuable in forcing on plants. The quantities per acre are from 1 to 1 ½ cwt. of nitrate of soda and 2 to 3 cwt. of salt.

Any fertilising substance which favours rapid and healthy growth is valuable.

As the outer leaves are usually the ones to be first attacked, it is well on small areas to remove and burn these.

DEL GUERCIO, GIACOMO. **Some Aphides in the Iberian Peninsula and other Localities.** (Intorno ad alcuni Afiditi della Penisola Iberica e di altre località raccolti dal prof. T. S. Tavares). — *Redia*, Vol. VII, fasc. II, pp. 296-333, 30 figg. nel testo. Firenze, 31 Dicembre 1911. **586**

Spain

This note contains a list of aphides, partly already known and partly new to science, collected by Professor T. S. Tavares in the Iberian Peninsula and other localities on numerous plants, some of which are likewise new as hosts of aphides.

Morphological particulars are given concerning the species thought to be new. Among these latter there is *Anuraphis Melampyri*, which lives on a species of the genus *Melampyrum* (1), and *Macrosiphoniella Chrysanthemi*, which causes notable injury to forced chrysanthemums.

BESSEY, ERNST A. **Root-Knot and its Control.** — *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin No. 217*, p. 88, 3 text fig., 3 pl. Washington, November 11, 1911. **587**

United States

The disease known in the United States as "Root-knot", "Beaded Root-knot", "Root-gall", "Eelworm-disease", "Big-root" etc., is characterised by root swellings often followed by the death of the plant. This disease is produced by *Heterodera radicicola* (Greef) Müll. This Nematode, originating probably from the tropics, is to-day disseminated throughout almost all parts of the temperate zone. The number of plants which are hosts of *Heterodera* is estimated at about 480, and among them are many field and garden crops. The biological cycle of this parasite is accomplished in four weeks or more according to the soil temperature. During the larval stage the Nematode invades the host plant and then becomes motionless, enlarges, and undergoes a kind of transformation; the males become wormlike in appearance, while the females on the contrary take the shape of a pear or a bottle. Each of the latter lays 500 eggs or more.

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(1) Some species of *Melampyrum* cause damage to sowings of wheat, barley, rye and oats; entire crops may be destroyed, or at any rate greatly injured. See P. VOGLINO, *Patologia vegetale*, p. 10, Torino, 1905.

(*Ed.*).

The *Heterodera* mostly passes the winter in the larval state in the soil, but may hibernate in the roots of perennial plants in a more advanced stage of development.

The following conditions contribute to the rapid multiplication of the Nematode: some degree of heat, a loose soil, moisture, and an abundance of nutritive substances.

The spread of the parasite may take place in different ways. Especially, the larvae themselves, moving on the ground, may pass from one point to another; they are likewise conveyed from field to field by implements, animals, men, carts, etc., and also by means of water, wind, and finally the plants and the manures brought to the fields. In hot-houses and nurseries *Heterodera* is effectively controlled by high pressure steam. The infected earth must be completely removed and the holes carefully cleaned. When the use of steam is impossible, the infected earth must, during the winter, be exposed alternately to cold and heat, and especially to dryness. If the land bears perennial plants, the parasite may be dealt with by the aid of a solution of formaldehyde (1 part in 100 parts of water), but the latter must be used cautiously.

In fields occupied by perennial plants the application of chemical substances has not given satisfactory results in the destruction of the Nematode. Where the trees are to be removed the parasite can be controlled by the use of carbon disulphide in the proportion of 3 to 4 oz. per square yard, distributed overnine holes per square yard, the holes being about 6 to 12 inches deep. Carbon disulphide cannot give reliable results when the land is already occupied by trees.

A good dressing and careful tillage will assist in controlling *Heterodera*, in the sense that the roots of the plants will penetrate deeper into the soil where the Nematode does not abound, or where it only comes in the adult state before the characteristic swellings have formed on the roots.

It will be well to avoid growing plants possessing a low degree of resistance.

In infected land not bearing perennial plants, it is first of all recommended to stop growing crops for two years, and afterwards to plant resisting species; and to use manures, especially those containing potash except where potash is already found in large quantities in the soil; to flood the soil for some weeks; to till and drain the soil when rain is not anticipated; and finally by suitable dams, to prevent healthy land being invaded by water flowing from fields where the presence of the Nematode has been noted. The best means however consists in obtaining, by means of selection and cross-fertilisation, types of plants capable of resisting the disease.

MEANS OF PREVENTION AND CONTROL.

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BERLESE, ANTONIO. **The Behaviour of *Prospaltella Berlesei* in Italy.** — (Come progredisce la *Prospaltella Berlesei* in Italia). *Redia*, Vol. VII, fasc. II, pp. 431-461. Firenze, 31 Dicembre 1911.

Italy

The following conclusions may be drawn from the observations made in Italy by the writer as to the behaviour of *Prospaltella Berlesei* in combating *Diaspis pentagona.*

1. *Prospaltella Berlesei* adapts itself perfectly to the climate of Upper Italy; it is very actively propagated in regions where winter is less lengthy and milder (Genoa, and environs of the Garda Lake), and more lowly in the regions with severer winters (Piedmont), where it probably goes through one or two generations less than in the hotter parts.
2. The winter colds, even the most intense, do not hurt *Prospaltella.*
3. The energy of spread of this beneficial insect is very considerable.
4. The behaviour of *Prospaltella* is everywhere such that according to the writer, it is certain to prove as useful as had been expected.

589

FRENCH, C. junior. **Beneficial Insects: Parasitic Wasps.** — *The Journal of the Department of Agriculture of Victoria, Australia,* Vol. IX, Part 12, p. 818. 1 Pl. Melbourne, December 1911.

Australia: Victoria

The Author reports that *Megalyra fasciipennis,* belonging to the Hymenoptera and commonly called the "Long-tailed Wasp" in Victoria, perforates live wood by means of its ovipositor and deposits its eggs in the body of the grubs of beetles which injure forest and fruit trees, chiefly the Long-horned Beetles and Jewel Beetles.

590 Canada **Destruction of Grey Worms (*Agrotis segetum*) and Wireworms *Elater segetis*), injurious to Tobacco in Canada. — See above,** No. 511.

591 TRUELLE, A. **Does Lime-washing Fruit Trees destroy Insects.** (Le chaulage des arbres fruitiers a-t-il une action insecticide?) — *Journal d'Agriculture pratique*, 76e année, No. 4, pp. 118. Paris, 25 Janvier 1912.

France

It was long believed that the practice of liming the trunks of fruit trees was an excellent method of destroying the animal and vegetable parasites of these trees.

On the strength of experiments conducted of late years, the Author believes that liming exerts no insecticidal effect on fruit trees, but that its action is rather to protect them against cold and heat.

With the addition of sulphate of copper and sulphate of iron the lime may be used for checking vegetable parasites (mosses, lichens and microscopic fungi).

For keeping animal pests under, recourse must be had to other methods of known efficacy.

INSECTS INJURIOUS TO VARIOUS CROPS.

592 G. D. G. **Insect Pests of Rice** (1). (I Friganeidi nuocciono al Riso. I Tafani del Riso. Le larve delle Tipule nocive al Riso). — *Redia*, Vol. VII, fascicolo II, pp. 466-467. Firenze, 31 Dicembre 1911.

Italy: Emilia

The attention of rice growers is directed to the damage caused by *Phryganea striata* and *Limnophilus rhombicus*. These insects are commonly known in Italy under the names of "farfalle acquatiche" and "farfalle pieghettate" when adult, and of "bruci acquatici" and "vermi timorosi" in the larval state. Failing other material they utilise the leaves of the rice plant which grows in the mud at the bottom of rice fields for the construction of the cases into which they withdraw, when passing into the nymphal state. It is not long consequently before large blanks are observed in the rice fields just sown, so that sowing has to be repeated several times.

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(1) See also *B.* Nov. 1910, p. 175; Jan. 1911, No. 305; Feb. 1911, No. 675; March 1911, No. 1054; April 1911, No. 1318; Jan. 1912, No 262. (*Ed.*).

This is what happened last year at Molinella (Bologna).

It is not difficult to recognise these insects in the rice fields, collect them and destroy them.

In the same rice fields at Molinella, the young plants sustained great injury from the grubs of *Tabanus dubius* Fab. and other insects of the genus *Tipula*.

G. D. G. ***Guerrinoccus Serratulae*, a Pest of Cultivated Leguminosae**. (La Cocciniglia farinosa delle Baccelline). — *Redia*, Vol. VII, fasc. II, pp. 468-470. Firenze, 31 Dicembre 1911. 593

Italy

This scale insect attacks a number of herbaceous and woody plants, and among others various leguminous plants to which it does great damage: *Vicia Faba, Medicago sativa, Trifolium incarnatum, T. pratense*, etc.

It passes from the herbaceous to the woody plants during fine weather and from the latter to the former from the end of autumn.

To prevent these scale insects from laying eggs on leguminous plants, the latter must be made to mature early by suitable methods of cultivation: by earlier sowing, the use of early seed and mineral fertilisers.

When the scale has invaded or is on the point of invading woody plants (vines, olive trees, elms etc.), the trunks must be stripped of their bark and the latter burnt; then an insecticide containing tar must be used, or the infected trunks must be carefully cleaned with a brush.

COLLINGE, WALTER E. **A New Pest of Mangels and Beet (*Cionus Scrophulariae* Linn).** — *Second Report on Economic Biology*, pp. 7-10. Birmingham, 1912. 594

In May last, Mr W. B. Grove submitted to the writer for identification, a number of larvae feeding on the underside of the leaves of the knotted figwort (*Scrophularia nodosa* Linn).

Great Britain

Shortly afterwards, the same larvae were received on mangel and beet leaves to which they were doing considerable damage.

Mr Collinge cannot find that this insect has previously been recorded as attacking any cultivated plants.

Economic Importance.

Hitherto, the insect has not been regarded as of economic importance, except in so far that it to a certain extent keeps down the knotted figwort which is a weed. But now that it has been found injuring the mangel and beet, two plants which cover a large acreage and which are valuable as food materials, the pest assumes a position of great economic importance. Whether or not, this insect will forsake its original food plant for those of cultivated crops, remains to be seen.

It frequently happens that such is the case in the change of a food habit of this kind, and it is therefore doubly important that those individuals that migrated from the knotted figwort to the beet and mangel should be exterminated; this is believed to have been done in the present cases.

Fowler (*Coleoptera of the Brit. Islands*, 1891, Vol. V, p. 323) describes it as rather local, but common where it occurs.

Food Plants :

Hitherto the species of this genus have been regarded as feeding only on plants belonging to the order *Scrophulariaceae*, particularly on species of *Verbascum* such as *V. Thapsus*, the great mullein, and *V. nigrum*, the black mullein, *Scrophularia nodosa*, the knotted figwort, and *S. aquatica*, the marsh figwort; its occurrence, therefore, on the mangel and the beet is certainly strange, but is only another instance of the change of feeding habits so common amongst insects.

Life-History and Habits.

Mr Collinge did not see the eggs, but they were probably laid on the undersides of the leaves early in May. The larvae received by him on June 15th were variable in size. They usually commenced to feed at that portion of the leaf nearest the petiole, eating away the two layers of parenchyma; later they returned and perforated the leaf by feeding upon the upper layer of the epidermal cells. The imagines appeared on July 10th and 11th; it was not proved that the beetles themselves fed upon the leaves.

Remedial Measures:

The food plants, such as the knotted figwort, etc., should be destroyed.

As the beetles probably hibernate in hedgeside debris, all such material should be burned.

The larvae frequently fall off from the underside of the leaves on the ground; these might be destroyed if again found attacking cultivated crops, by scattering soot and lime or kainit on the surface of the ground.

COLLINGE, WALTER E. **The Cabbage Aphis (*Aphis Brassicae* Linn.).** *Second Report on Economic Biology*, pp. 4-5. Birmingham, 1912. **595**

Great Britain

Undoubtedly the greatest and the most objectionable pest attacking the cabbage plant is this aphis.

Often the actual amount of damage done is small, but the plants become unmarketable owing to the slimy mass of insects and their excreta.

Life-History:

The eggs are deposited on the under-face of the leaves of wild species of *Brassica*, cabbage, Brussels sprouts and other cruciferous plants at the end of October, or early in November, and hatch out early in May. It is not until the year has well advanced that they do any considerable damage, although plants received from Cheshire in July 1905 were blistered all over, most of the leaves having many yellow patches on them.

In the early part of the year, the larvae are covered with a mealy-like substance, and seem to spread slowly.

There is active migration late in the summer from such plants as shepherds' purse (*Capsella Bursa-pastoris*), charlock or wild mustard, etc.

Indeed it would seem as if they prefer the cultivated plants in the autumn. Here they excrete large quantities of a sticky honey-dew, which covers the leaves and stems, making most plants unmarketable, and if largely infested, killing them.

In spite of the beneficial work of certain hovering flies (*Catabomba Pyrastri* Linn. and *Syrphus Grossulariae* Meig.) and Ladybird beetles, once they attack a plant they seem to flourish.

None of the remedies known of by the writer are of any value except where employed on a small scale.

For gardens, or small areas, three or four weekly applications of ¼ lb. of soft soap to 1 gallon of water will usually keep the plants clear.

All cruciferous weeds should of course be destroyed.

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(1) See *B.* May 1911, No. 1566. (*Ed.*).

596 **Spraying for Big Bud of Black Currants** (1. — *The Journal of the Board of Agriculture*, Vol. XVIII, No. 10, pp. 847-848. London, January 1912.

Great Britain

One of the officers of the Board of Agriculture carried out some experiments at Harvington (Worcestershire) to test the efficacy of various sprays for combating big bud of black currants.

The sprays used were:

(1) A dry mixture of lime and sulphur (1 part of air-slaked lime to 4 parts of sulphur).

(2) Quassia and soft soap (2 lb. of quassia chips boiled for 2 hours, 1 lb. of soft soap and 10 gals. of water);

(3) Soft soap alone at the rate of 1 lb of soft soap to 10 gals. of water.

Sprayings with the above mixtures were carried out on the 20th April, and 4th and 25th May

A microscopical examination of big buds of the diseased black currants carried out in September made it evident that the sprayings were in some degree effective, although they had not completely destroyed the *Phytoptus*

Of the three mixtures tried, the lime and sulphur proved the most effective. The untreated plants had 66 7 % of diseased buds, while those treated with lime and sulphur had only 45 5 % of diseased buds

597 G. D. G. **The Cicada as a Pest of Olive Trees and Other Cultivated Plants.** (La cicala è fra i nemici dell'Olivo e di altre piante coltivate). *Redia*, Vol. VII, fasc. II, pp. 465-466. Firenze, 31 Dicembre 1911.

Italy: Calabria, Apulia

According to the observations made in Calabria and Apulia, the common cicada attacks the branches of the olive tree, which become stunted and then shrivel during the summer, to the great detriment of the flowers and fruits brought forth.

Nor is this all; the insect attacks the olive direct and even in many cases the branches of pear, apple, almond and apricot trees; in this way it causes injury which is not always observed, but which is very grave under certain conditions of time and season.

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(1) See also *B.* June 1911, Nos. 1941 and 2019. (*Ed.*).

598 G. B. **Enemies of the Cocoanut Tree** (1). — *Bulletin Agricole du Congo Belge*, Vol. II, No. 3, pp. 512-528, figg. 243-257; No. 4, pp. 723-731, figg. 336-339. Bruxelles, Septembre-Décembre 1911.

India, Malaysia, Africa, etc.

A detailed description of numerous pests, animal and vegetable, of the cocoanut tree in various countries (India, Malaysia, Africa, etc.) indicating means of control.

The insects are the most terrible enemies of the cocoanut tree. We may mention among others the termites, and some kinds of ants causing havoc to the plants and the cocoanuts planted in the ground. To deal with these it is advised that salt or ashes be mixed with the earth, or that the nuts should be dipped before planting in a solution consisting of 300 grammes of sugar, a little arsenic and flour, and 10 litres of water.

Moreover, various beetles damage the cocoanut tree to such an extent as to kill it, in consequence of the galleries they tunnel in the stem of the plants. Among them we may mention: *Oryctes rhinoceros* L., *O. boas*, *O. monoceros* Ol., *O. Preussi* Kolbe, *O. Anglias*, *O. colonicus* Coq., *O. insularis* Coq., *O. Pyrrhus* Burm., *O. Ranavalo* Coq., *O. simiar* Coq., *Pimelopus tenuistriatus* Aulm., *P. Preussi* Aulm., *P. robustus* Aulm., *P. pygmaeus* Aulm., *Camelonotus quadrituber* Fairm., *Strategus alveus* F., *Xylotrupes Lorquini*, *Scapanes australis* Boisd., *S. grossepunctatus* Sternbg., *Trichogomphys Semmelincki*, *Oryctoderes latitarsis* Burm., *Rhinchophorus ferrugineus* Fabr., *R. Phoenicis*.

The best method of controlling these insects consists in carefully collecting them and afterwards destroying them. Lamp-traps may also be used.

Other beetles, on the contrary, chiefly attack the leaves of the cocoanut tree. We may mention: *Brontispa Frogattii* Sharp, *Promecotheca antiqua* Weise and *P. opacicollis* Gestro. The *Brontispa* has natural enemies in the form of some Ichneumons to which it would be desirable to give facilities for multiplication.

Among the Coleoptera there further appear as enemies of the cocoanut tree *Euritrachelus intermedius* Gestro, and *Mycterophallus xanthopus* Boisd.

Among the Lepidoptera the cocoanut tree also has enemies in the form of a representative of the family of the *Gelechiidae*, and the larvae of *Padraona chrysozona*, *Thosea cinereomarginata*, *Thosea sp.*, *Erionota thrax*, *Brachartona catoxantha*, etc. The destruction of some of these insects is promoted by their natural enemies. They may also be destroyed direct or by employing insecticides.

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(1) See *B*. Nov. 1910, p. 161; Dec. 1910, p. 368; Feb. 1911, No. 689; June 1911, Nos 2004-2005; July 1911, No. 2040; Aug.-Sept.-Oct. 1911, No. 2688. (*Ed.*).

Locusts may likewise damage the plantations when they appear in large numbers.

Again, among scale-insects there is a rather formidable enemy, *Aspidiotus destructor* Sign., which is chiefly kept under by some ladybirds and also by the use of insecticides.

Less numerous, but no less dangerous are the vegetable parasites of the cocoanut tree. The most widespread disease is certainly the Bud Rot, which is dealt with by means of Bordeaux mixture and by burning the parts of the plant affected.

Another cryptogamic disease attacking old cocoanut tree stems is that known under the name of Bleeding Disease, attributed to *Thielaviopsis ethacetica*.

The roots of the cocoanut tree are often invaded by a species of *Botryodiplodia*. Burning the dead parts and applying a lime, ash or dung dressing to the soil are effective remedies for this disease

The leaves of the young plants may be attacked by *Pestalozzia. Palmarum*, which is controlled by sprayings with Bordeaux mixture.

Other diseases of cocoanut leaves have also been pointed out, the causes of which are as yet unknown.

Among the pests producing a decline of yield, without however directly injuring the plant, and which are consequently only injurious to the planter's interests, the following must be pointed out:

1. Rats (*Mus Doriae, Opossum*), large numbers of which make their nests among the leaves of the plant, and gnaw the fruits away gradually: to destroy them rat poison must be used, and to prevent their climbing up the plant the stem must be fitted with metal rings.
2. Squirrels.
3. Monkeys (*Cynocephalus, Cercopythecus albigularis ?, Galago* sp. ?), which pierce the fruits and empty them of their contents. They are shot.
4. Bats, which cause damage similar to the foregoing and are dealt with in the same way.
5. Hyenas.
6. Birds, especially *Cacatua galerita*, which eat the pulp of the fruit.

7. A terrestrial Crustacean (*Birgus latro*) which feeds on the fallen fruit and those it manages to detach from a tree by climbing up the stem.

Wild swine as well as porcupines cause great mischief to the plantations, the former destroying the young plants in thousands and the latter gnawing the stem of the full grown trees till they are completely perforated. Against the former, successful use is made of arsenic mixed with foods (fruits, tubers etc.).

INTERNATIONAL INSTITUTE OF AGRICULTURE

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The Canadian abstracting is by Mr. J. K. Doherty, the able chief of the Canadian Bureau of Correspondence with the International Institute of Agriculture.

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of February and March 1912.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES DEALING WITH AGRICULTURE AND INDUSTRIES DEPENDENT ON IT.

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(Note on the Establishment of Experiment and Demonstration Fields according to Art. 131 of the Financial Law of July 13, 1911 and the Decree of Sept. 20, on the Allotment of Grants for Promoting the cultivation of Olive Trees. — *Journal Officiel de la République Française*. No. 36, pp. 1082-1083. Paris, 26 Février 1912.

France

According to instructions issued by the Ministry, the agricultural associations or cooperative societies of olive growers, which benefit by the grants must cultivate for their own account the experiment and demonstration olive yards, and this holds good both whether these olive yards are their property or if they are only rented. An exception is made in the case of olive yards in which experiments against parasites will be carried out.

The amount of the subsidies granted may not exceed 75 % of the total estimated expenses.

The note states the conditions that the experiment and demonstration fields are to fulfil.

The experiments and demonstrations are divided into two classes:

1. Improvement of cultivation.

2. Control of parasites.

The olive yards belonging to the first class will be chiefly demonstration fields.

The others, at least for certain parasites, will have more the character of experiment fields, being devoted to testing the action of treatments, the efficacy of which has not yet, nor in all cases, been sufficiently demonstrated.

A control plot will always be necessary to allow of results being checked.

As regards the fields for the improvement of the methods of cultivation, experiments and demonstrations in the following subjects will be carried out, either simultaneously or separately :

a) Cultivation of the soil ;
b) Manuring ;
c) Pruning ;
d) Irrigation.

The experiments and demonstrations to combat the parasites of the olive tree will include the following animal as well as vegetable pests: *Cycloconium oleaginum*, canker of the stem and branches, fumago, *Lecanium oleae, Dacus oleae, Prays oleellus, Thrips oleae.* But the above list is not exclusive.

The following particulars will have to be supplied by any association desirous of organizing one of the above fields :

Information on the olive yard Generalities, nature and analysis of the soil, situation, and aspect ; number of plants, and area, number of plants of each variety, age and state of the trees, average annual yield during the last few years; information on the cultivation and manuring of the soil, and on the pruning and other treatments to which the trees have been submitted.

Programme of the proposed work:

1. Cultivation of the soil.

Number of times the soil is to be ploughed in the course of the year, dates and depth of such work. Number of times the soil will be loosened superficially, dates at which such work is to be done, and implements used; hoeing round the trees.

2. Manuring : whether it is intended to manure every year, or every two or three years, with what manures, how and when to be used.

3. Pruning : what kind of pruning it is proposed to follow (vase, dome or table-shaped) ; every year or every two, three or more years ; at what time of the year ; supplementary pruning (suppression of superfluous shoots, of shoots from the foot of the stem etc.).

4. **Irrigation**: number of irrigations per year, quantities of water, time of the year for irrigating.

As for the control of one or more pests, it may either be the object of a distinct experiment in an olive yard especially chosen for the purpose, or it may be carried out in one of the cultural experiment fields.

The programme of the work that the associations intend to carry out, in order to avail themselves of the grants, must always be accompanied by a detailed estimate of the probable expenses.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

PEREZ, GEORGES V. **Agriculture in the Canaries.** (Notes agricoles et horticoles sur les Canaries).—*Journal de la Société Nationale d'Horticulture de France.* Tome XIII, pp. 42-46. Paris, Janvier 1912. **600**

Canaries

For some years, the principal crop of the Canaries has been *Opuntia cochenillifera*, grown for rearing the cochineal insect, which is exported on a large scale for the manufacture of the crimson dye; 25 millions of lire (£1 000 000) worth being exported annually. Larger quantities of soda and potash than even of cochineal insects are exported. The former substances are obtained from "barrilla" the ash of *Mesembryanthemum crystallinum* and *M. nodiflorum.* The cacti, which are intensively cultivated for the cochineal, never lose their vegetation however much they are attacked by successive generations of these insects, which shows the enormous powers of resistance possessed by the plants.

In the south of Teneriffe, and on the island of Lanzarote, a method of dry-farming has been employed for years which permits of the cultivation of onions, maize and peas in a district where the annual rainfall does not exceed 250 mm. (10 in.).

The system consists in covering the ground with a layer 20 cm. (8 in.) deep of "*zahorra*" a volcanic sand or tufa, rich in potash and phosphates, and possessed of unusual hygroscopic properties, which preserves the moisture of the soil and hinders evaporation. The system originated in the Sahara.

In the Canaries the Chinese banana (*Musa Cavendishii*) is cultivated; it succeeds well everywhere because there is plenty of water and of good fertilizers. The centre of cultivation is Orotava, which lies beneath the table-land of Cañadas 2 000 metres (6500 ft.) high; the water from the table-land is tapped by tunnels, and is distributed for irrigation by aqueducts, so that there is a never-failing supply.

The flora of the Canaries contains many little-known plants. The shrub "tagasaste" (*Citisus proliferus*, var, *palmensis*) resists drought in a remarkable manner. It is a forage plant of the greatest importance throughout the whole of N. Africa. All the cattle of the Canaries are fed on this shrub. It is not allowed to grow large, as when cut down it shoots up twice or thrice a year. The trunk should never exceed 1 metre (3 ft. 3 in.) in height. Such a shrub has all the advantages of lucerne, also it is more nutritive and does not require irrigation. Further, its magnificent flowers offer great attractions to bees. Besides the "tagasaste" the following plants should be mentioned: "Gacia" (*Cytisus stenopetalus*), and *Genista splendens*, used for forage, and *Cytisus nubigenus*, *Ulex europaeus*, *Psoralea bituminosa* and *Lathyrus tingitanus*, which are of less value for fodder.

Noticeable among the flowers of the Canaries is *Statice*, which is very well adapted to the Mediterranean districts. Species of *Echium* also supply good forage and are drought-resistant.

In the Island of Lanzarote, sisal grows well; it was introduced there recently as an experiment. In the same place there is geyser water; this can be obtained by boring and is of the greatest use in the cultivation of bananas, which bring to the Canaries a yearly revenue of 2 500 lire per hectare (£40 per acre).

601 BUTLER F. G. **Agricultural Progress in Newfounland.** — *The Maritime Farmer.* St. John, N. B., Can., Vol. 17, No. 6, December 26 1911.

New-foundland. Canada

The Agricultural Society of St. John's Newfoundland, is busy importing and supplying to farmers seeds and machinery of the best quality obtainable in Canada, at greatly reduced prices; also lambs, calves, cows, swine and other animals of pedigree stock, free of Customs duty. Much agricultural literature including farm papers, experiment station and other government reports, is being distributed to farmers.

Already three shipments of sheep have been imported from Canada and shared out by the Board of Agriculture. In order to enable farmers to carry on sheep raising in safety in St. John's East and West, it has been decided to have a vote taken in this electoral district with a view to prohibiting the keeping of dogs after May 1st, 1912.

In the distributing of live-stock a signed agreement is entered into between the President of the Agricultural Society and the Keeper of the Society's live-stock, wherein the former agrees to provide, and the latter to take and keep at his own risk and expense in good order for service at his farm, the animal or animals transferred, for a period of three years from the date of the agreement. The keeper also agrees to keep a record of the pedigree of the progeny of each animal placed at his disposal. At the termination of the three-year period, if all parts of the agreement have been lived up to, the animals involved become the property of the keeper.

602 SCHLOSSMACHER, I. **Development of Agriculture in Kamerun.** (1) (Wirtschaftliche Tatsachen und Möglichkeiten aus Kamerun). — *Deutsche Kolonialzeitung*, Nr. 6, pp. 84-86. Berlin, 10. Februar 1912.

In the last nine years the agricultural exportation of Kamerun has gone steadily up, as seen by the following figures:

1902	£327 000
1909	£772 000
1910	£1 080 000

Kamerun

This shows a three-fold increase in the nine years.

The principal articles of export are rubber, palm-nuts, palm-nut oil, and cocoa. The exportation of all these, however, is susceptible of considerable increase. At present the plantations of rubber and cocoa are hardly in bearing, and new districts are being opened up where rubber and palm-nuts can be grown.

For the development of the trade in palm-nuts and palm-nut oil, factories must be set up.

The future of rubber, palm-nut oil and cocoa in the world's commerce is indisputable, so that from this point of view Kamerun is favourably situated. The exportation of ivory, however, is steadily declining; but this might be made up for by growing tobacco, which has been shown to give excellent crops in Kamerun.

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(1) See *B*. Jan. 1911, No. 14; July 1911, No, 2047; Jan, 1912. No. 20. (*Ed.*).

There is further great scope for the exploitation of timber, both common and choice.

Live-stock breeding should not be excluded. In the Upper Kamerun the Breeding Station supported by the Government and by a Mission has started experiments in conjunction with cultivators, and has obtained good results. But live-stock can only be of local value and will not serve for exportation.

For rubber development two laws are required: the first should protect rational exploitation from the destructiveness of the natives; the second should deal with the commercial classification of rubber, so as to improve its position on the world's market.

The chief zone of rubber plantations, belonging to Associations, is in the northern mountain and forest regions, but there are also some at Sanga and in the south.

The demand for land for cultivation is increasing. The government has decided to contract leases and sales only with a guarantee of cultivation, so as to prevent speculation which may end by leaving the land uncultivated.

The progress of Kamerun is bound up with the development of railways and other means of communication, as well as with the regulation of watercourses.

608 GIRIEND (French Consul at Zanzibar). **Agricultural Exports from Zanzibar in 1910.** (L'Exportation agricole de Zanzibar en 1910). — *Rapports Commerciaux des Agents diplomatiques et Consulaires de France:* No. 976; pp. 1-17. Paris, 1912.

Zanzibar

For some years there has been a sensible decrease in agricultural exports from Zanzibar. This is due to the fact that the commerce of the interior is being deviated to the English port of Mombasa and the German port of Daressalam. It is very regrettable that agricultural interests have not been developed in time to lessen the consequences of competition.

The present state of things is caused by the penetration of three important railway systems into regions hitherto neglected: 1) the Mombasa line to Lake Victoria; 2) the Tanga line to Kilimandjaro, and 3) the Daressalam line to Tabara.

In 1910 the total value of the exports from Zanzibar amounted to £1 054 136.13*s*. They consisted of three distinct groups. The first two included products imported from Europe, America, Asia, and Africa, and belonging to the old transit trade of Zanzibar, while the third was composed of local products. These articles were cloves, coprah, and cord made of the fibres of the coconut.

Of these the exports in 1910 are valued at:

Cloves	£	258 539
Coprah	»	223 757
Coconut fibre ropes	»	3 458

The increase is due entirely to the coprah and the cord, as there was a considerable diminution in the amount of cloves exported. The local production of coprah is now considerable, this has been favoured by the high price coprah fetches on the world's market, (as much as £26 per ton has been paid for it).

The improvement will continue, and even advance, as many plantations are not yet productive.

The coconut palm is much mose profitable than the clove-tree. It bears sooner and more regularly ; it requires less labour; it yields four times a year; its fibres can be made into ropes, its leaves into roofing for huts, and its woody rind into fuel.

RURAL HYGIENE.

SCHROEDER E. C, **The Relation of Bovine Tubercolosis to Public Health,** — *Appendix* 11, *Eleventh Annual Report of the Canadian Association for the Prevention of Tuberculosis.* Ottawa, Canada, 1911, p. 107-124. **604**

Canada

After reviewing briefly the progress that has been made in the study of tuberculosis, the author states two facts whith which the subject deals: 1) That the tubercle bacilli that attack mammals, including the human species, are of two distinct but closely related types, the human type and the bovine type ; and 2) that human and bovine types are found in human tuberculosis.

Of 438 tuberculous persons examined in the Research Laboratory of New York City, 32 or 7 1/3 per cent showed tubercle bacilli of the bovine type. Of those older than 16 years less than one-third of one per cent showed bovine tubercle bacilli ; between the ages of 5 and 16 years 16 2/3 % showed bovine tubercle bacilli, and of children less than 5 years old 26 1/5 per cent showed the same bacilli.

Considering the source from which bovine bacilli are disseminated in a manner that leads to their introduction, alive and virulent into human hodies, the author points out that meats and meat products do not require special consideration because these are sterilized by cooking before being eaten. He expresses the view that through the agencies of milk, cream, butter etc. the tuberculous dairy cow, under existing conditions, may be charged with practically all the human tuberculosis that is not caused by tubercle bacilli expelled from bodies of human tuberculous individuals.

The author's general conclusions are briefly stated as follows:

1. It has been proven absolutely, that bovine tnberculosis is responsible, for a not yet well defined proportion of human tuberculosis, but a proportion that is now known to be entirely too large to be ignored.

2. It has been proven absolutely, that a large proportion of the tuberculosis that occurs among children is chargeable to the bovine source of infection.

3. It has been proven that tubercolous cows need not be visibly diseased to expel tubercle bacilli from their bodies in a dangerous way.

4. The satisfactory protection of public health against tuberculosis due to infection from the bovine source requires that we should either pasteurize or sterilize all milk or obtain it from cows proved by the tuberculin test to be free from tuberculosis.

5. Tuberculosis among cattle, apart from the direct infection of persons with bovine tubercle bacilli, is a condition we must fight early and late, until it has been fought to an end, otherwise we will neglect what the proper conservation of the human food supply urgently demands. This means the control and, eventually, the eradication of bovine tuberculosis and we can go a long distance and spend much thought and money, without even approximating the value of the magnificent returns the accomplished eradication of bovine tuberculosis will give, not alone to those who are interested in different branches of animal husbandry, but to the whole people.

605

The Control of Pellagra in Roumania and the Bukowina. (Combaterea pelagre). — *Càmpul*, an. XI. no. 1, pp. 23-25. Bucuresti, Januarie 1912.

Roumania. Austria. Hungary: Bukowina

In his last report on the control of pellagra in the Bukowina, the General Director of the Sanitary Service points out that up to 1912 only few pellagra patients were received in the hospitals, and that recently their numbers have constantly increased. The great majority of these patients belongs to the poorest and most hard-working classes; the greater part of them do not own land, nor milk-producing animals

In 1905 the Roumanian State Administration voted 15 750 fr. (£625) for the control of pellagra, and the Government of the Bukowina 5 250 fr. (£208. 6*s* 8*d*). The total sum was devoted to the construction of a hospice for pellagra patients from the districts of Cernauti, Radauti, and Luceava, in which 211 sick were treated for some months.

In 1906 the State gave 15 750 fr. (£625), the Government of the Bukowina also £625 and some religious corporations 10 500 fr. (£416. 13*s* 3*d*). These funds were partly employed in opening, in 12 communes situated in 5 districts, hospices in which, for a length of time, 471 pellagra patients were treated; the rest of the money, 1 050 fr. (£41. 13*s*. 4*d*.) was spent in the purchase of artificial manures which were sold at half price to the small landowners suffering from pellagra. Besides the above measures, the Minister of Agriculture devoted 15 750 fr. (£625) a year to the purchase of milk-producing stock, the milk of which was distributed to the pellagrous poor.

The results which attended the use of wholesome and improved nourishment were very satisfactory, provided that this better diet would be enjoyed, without interruption, for a period of one to two years. 291 women and 259 men were treated in these hospices. The women suffering from this disease are more numerous than the men, because the latter emigrate during the periods in which there is a demand for agricultural labour, and leave their women in the greatest poverty.

The great majority of patients received in the hospices are between 41 and 50 years old, then come those between 31 and 40; children suffer least from this disease and their number reaches only 2% of the patients admitted into the hospices.

An enquiry has shown that out of 1250 pellagrous patients 169 did not own the smallest plot of land, 359 had an insignificant area; 454 had not enough to keep their families upon it, 160 had a small but sufficient property. Only 47% owned some cows.

The report again furnishes evidence that the best prophylactic measure against pellagra consists in an improvement of economic conditions.

ROPER, CHARLES. **Some Effects of the Climate on the Health of Imported Tea-Garden Labour in Assam.** — *The Journal of Tropical Medicine and Hygiène,* Vol. XV, No. 4, pp. 49-57. London, February 15, 1912.

The following is a summary of the more important conclusions arrived at by the writer from a consideration of the effect of climate and mode of life on imported tea-garden labour in the Lakhimpur and Darrang districts, Assam:

British India: Assam

1. The first two years of residence are the most trying for coolies, and much more so for men than for women.

2. The proportional mortality from anaemia in women increases with length of residence; in men it remains about the same.

Whereas male deaths from all causes under two years' residence: ditto over five years : : 180 : 118, and similar female figures show the proportion 160 : 138; considering anaemia cases only, males show 28 : 18, and females 43 : 43. As the best pluckers on a tea-garden are to be found amongst adult women of senior residence, in the writer's opinion it is the hard work toward the end of a season which particularly affects the women.

3. The death-rate from malaria amongst children under 5 years of age is about twice as heavy amongst boys as amongst girls. In adults it is two or three times as heavy amongst women as amongst men, this disproportion tending to increase with length of residence.

The total sex deaths being equal (48 male and 47 female) amongst infants and children up to 5 years of age, we get males: females : : 30 : 17; amongst adults we get females: males : : 25 : 11, and taking those of over four years' residence in Assam, females: males : . 15 : 5.

4. The mortality from bowel complaints is very disproportionately high in comparison with that of all causes of death in the first two years.

	Males		Females	
	Under 1 year's residence	Over 5 years' residence	Under 1 year's residence	Over 5 years' residence
Deaths from all causes . .	93	118	71	138
» » diarrhoea and dysentery	52	42	34	32

5. Amongst coolies over 45 years of age the mortality from bowel complaints becomes greater amongst women and less amongst men.

6. There is reason to think that acclimatization for dysentery occurs in some degree amongst imported tea-garden labour.

Under 1 year's residence total deaths : dysentery deaths : : 164 : 67 ; over 5 years' residence total deaths : dysentery deaths : : 256 : 35. On the other hand some figures given by Bryden tend to show that there is no acclimatization for dysentery amongst Europeans.

7. Length of residence tends to predispose coolies to death from pneumonia.

	Under 1 year's residence	Over 5 years' residence
Deaths from all causes	164	256
» » pneumonia . . .	8	43

8. The proportion of deaths amongst acclimatized coolies from pneumonia to those from all causes, while markedly increasing in males, does so in a far greater degree in women.

	Males		Female	
	Under 2 years' residence	Over 5 years' residence	Under 2 years' residence	Over 5 years' residence
Deaths from all causes . .	180	118	160	138
» » pneumonia . .	28	28	12	15

BEST, W. **Anti-Malarial and Anti-Yellow-Fever Work in Calabar, Southern Nigeria.** — *The Journal of Tropical Medicine and Hygiene*, Vol. XV, No. 4, p. 60. London, February 15, 1912. **607**

S. Nigeria: Calabar Gold Coast. Sierra Leone

A most energetic and continuous campaign has been recently carried on in Southern Nigeria against the carrier of malaria. The clearing of bush and rank vegetation, reclamation of swamps, destruction of mosquito breeding places, the use of kerosene oil for collections of water which cannot be otherwise treated, the filling-in of surface depressions, the use of anti-mosquito wire-gauze for rooms and houses, and the use of quinine as a prophylactic were the chief measures undertaken.

The quantity of quinine issued during 1911, for prophylactic use alone, was as follows: — 275 671 gr. to natives (gratuitously); 125 000 gr. to European officials; 52 090 gr. to European non-officials. In addition, arrangements have been made for the issue of this drug gratuitously to all children (50 per cent. of whom harbour the malarial parasite) attending Government Schools.

Information was received in the month of May that yellow-fever had appeared on the Gold Coast and Sierra Leone, in an epidemic form. In order to prevent its introduction into Southern Nigeria, energetic measures were adopted, especially in the chief littoral stations. Quarantine restrictions, the erection of a quarantine station hospital, visitations and inspections, etc. were carried out as precautionary work. In addition, destruction of mosquitoes and the abolition of their breeding places, clearing of all bush and rank vegetation were rigorously carried out, special attention being paid to receptacles capable of forming a potential breeding ground for the *Stegomyia* mosquito, the carrier of this disease.

The result of the work done was most beneficial, the general sanitary condition being greatly improved.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY.

608 ZAGO, F. **The Institute of Agriculture and Domestic Economy in Florence.** (L'Istituto Agrario femminile e di Economia Domestica di Firenze). — *Giornale di Agr. della Domenica.* Piacenza, 7-14 Gennaio 1912.

Italy

The aim of the above Institute is to instruct young women in the elements of agriculture and of domestic economy and to teach them to keep house well and look after their families. The school was founded in 1908 on the initiative of a Committee of ladies. The teaching is entrusted to a staff of professors who are specialists in the following subjects: gardening, bee-keeping, poultry-rearing, cheese-making, preserve-making, fruit-growing and horticulture, domestic economy and general hygiene, dress-making and cooking, infantile hygiene.

The horticultural, fruit-growing and gardening work is carried out in the garden, kitchen-garden and orchard belonging to the school, and also on the large farm, in the green-houses and gardens of the Royal School of Fruit-growing.

The school admits girls who have completed their fourteenth year, and can show certificates of work from public or private schools equivalent to the leaving certificate granted by the technical school or gymnasium.

In 1911, the number of students on the list was 40; they belonged to various classes, about one third were elementary teachers, one third belonged to the middle class and the remaining third to the aristocracy.

It is the intention of the Committee of the school to entrust to such students, as have shown special aptitude, the instruction of classes for rural labourers, with the aim of extending the influence of the Institute in the country, and also to have travelling courses of instruction for the wives of farmers and peasants in the country, and for artisans in the town. Amongst other schools of domestic economy in Italy, may be mentioned those of Niguarda established in 1902, of Turin in 1907, and of Bergamo in 1908.

FERNANDEZ DE LA ROSA, G. **Agricultural Instruction in Spain** (La enseñanza agricola en España). — *Boletín de Agricultura Técnica y Económica*, N. 37, pp. 45-55. Madrid, 31 Enero 1912. **609**

Spain

After touching on the special characteristics of agricultural science, and briefly describing the stage which had been reached during the three great historic epochs, the writer passes to consider the impulse given in the 19th century to the means of instruction.

In 1813 Chairs of Agriculture were created by royal decree in all the capitals of provinces. But this ordinance, like those of 1819 and 1821, was never put in force. It was not until 1890 that the decree of 1849 for the foundation of three practical schools of agriculture — one in the centre, another in the North, and the third in the South of the peninsula — found practical application.

Then the Schools of Tudela in Navarre, and of Oñate in Guipúzcoa were established. In 1855 the Central School of Agriculture was founded, now the Special School of Agricultural Engineers, established in 1869, in the domain La Florida, which at that period formed part of the crown property. To the well-appointed laboratories, scientific collections and museums which it already possessed, this School has recently added a Station for plant pathology, an agronomic station, an experimental farm for New Castille, and lastly a machine experiment station instituted by de Arce. All these establishments are not interdependent, but the needs of the different services necessarily brings them into close connection. The writer shows the necessity of constructing the projected new edifice for the Special School of Agricultural Engineers. He proposes to deal in another article with the internal organisation of the School, and of the institutes to which it has given rise, and concludes with a brief survey of the legislative provisions which have contributed to raise the status of the agricultural career. He specially mentions the royal decree of 14 February 1879, with called into existence the corporate body of Agricultural Engineers, and subsequent laws providing for experimental farms and Schools, oenologic stations, experiment fields and the like.

610 **International Students' Judging Competition.** — *Farmers' Advocate*, London, Canada, December 14, 1911, p. 2065, and *Canadian Farm*, Toronto, Canada, December 22, 1911, p. 7.

Canada. United States

There was held at the International Live Stock Show at Chicago in December, 1911 the annual competition in judging live stock between students of Agricultural Colleges in North America. Ten colleges competed, each having a team of five men. The animals judged consisted of Belgian and Percheron stallions and Belgian geldings, Shorthorn heifers, Angus steers and Hereford bulls; Hampshire rams, Southdown wethers and Lincoln wethers; Duroc-Jersey barrows, Berkshire sows and Poland-China boars.

Fifty points were allowed for correct placing and fifty points for perfect reasons.

Of the ten colleges which competed, three are Canadian institutions and these won the 1st, 2nd and 4th general awards. Of the ten individual students scoring highest points seven belong to Canadian colleges. Five thousand was the maximum number of points possible. The complete standing of the colleges with the score made by each is as follows.

Macdonald, Quebec, Canada, 4363 ½; Manitoba, Canada, 4335 ½; Missouri, U. S. A. 4315; Ontario, Canada, 4205; Iowa, U. S. A. 4154 ½; Texas, U. S. A. 4121; Montana, U. S. A. 4120; Ohio, U. S. A. 4108 ½; Kansas, U. S. A. 4069 ½; Nebraska, U. S. A. 4032 ½.

611 RICE Prof. JAMES E. **The New Poultry Building at Cornell University, U. S. A.** — *Th Illustrated Poultry Record*, Vol. 4, No. 5, pp. 207-209. London, February, 1912.

United States

The Poultry Husbandry Building, now in process of construction at Cornell, is the result of a special appropriation of $ 90 000 made by the New York State Legislature of 1909-10. It contains a basement, three stories and an attic. On the basement and first floor are the killing room, the egg handling and testing room, the laundry, storage room and other offices. The second floor contains a general office, and five private offices, a general research laboratory, a library, an exhibition room, a seminary room, and a small recitation room. The third floor includes a large lecture room, two large laboratories, a photographic room and a recreation room. The latter will also serve as a meeting place for the Poultry Association and the Winter Poultry Course Club. It is planned eventually that there will be loggias extending from each end of the main building, and leading to a judging pavilion to the west, and an incubator building and brooder houses to the east. The chickens will be reared, the breed testing project will be carried on, and the regular investigational work will be conducted on the fifty-acre poultry farm North of Forest Home, about three-quarters of a mile from the teaching plant.

The main building, the extension and the auxiliary buildings, when completed as planned, will provide accommodation for teaching at one time one hundred or more winter course students and nearly three hundred regular and special students in the elementary lecture, laboratory, and practice courses.

ZIMMERMANN, A. **The Imperial Biological Agricultural Institute at Amani, German E. Africa.** (Das Kaiserlich Biologisch-Landwirtschaftliche Institut Amani). — *Ill. Landw. Zeitung*. Berlin, 10. Februar 1912. **612**

German East Africa

The Biological Agricultural Institute of Amani was founded in 1902 by Count v. Götzen, then governor of German E. Africa. Its objects are the following:

1. Research, from a practical point of view, of the necessary conditions for the growth and development of cultivated tropical plants.

2. Researches on the diseases and insect and other pests of cultivated plants, and on the means of prevention and cure.

3. Soil analyses; experiments on manuring; analyses of raw materials and of animal and vegetable products, which present any interest either as matter for exportation or as human food or medicinal substances.

4. Study of the flora and fauna of German E. Africa.

On account of its favourable conditions of soil and climate, Amani, in the mountains of Eastern Usambasa was chosen as the site of the Institute. The land belonging to it is 741 acres in extent and rises from an altitude of 1300 feet, on the banks of the river Sigi, to 3575 feet at the top of Mt. Bomole.

Thus at Amani, exclusively tropical plants, such as cocoanuts, black pepper, *Hevea brasiliensis* etc. may be grown together with sub-tropical ones, such as chinchona and camphor trees, conifers, etc.

The station of Mombo at the foot of West-Usambasa completes the experiment station of Amani by affording a great extent of land in the plain.

The principal buildings and the laboratories of the station are situated at nearly 3000 ft. above sea-level.

An area of about 250 acres has already been cleared of forest, preparatory to being cultivated, and about thirty miles of roads have already been built in the estate. The following figures will give some idea of the importance of the available material of the station:

During the year 1910-1911, 402 consignments were made, of which 359 to private persons and 43 to State institutions; they comprised 8169 plants, 45 packages grasses, 1002 cuttings and 7000 bulbs, besides 2927 parcels of seeds grown for the most part on the land of the station. It is expected that in the current year the number of plants and seeds to be distrituted will be much greater.

The Institute has devoted a good deal of its activity to the study of improved methods of growing and preparing tropical produce. Thus, for rubber, by adopting a new method of coagulation it has been possible to diminish considerably the cost of production; in the preparation of camphor and the gathering of chinchona bark the new methods introduced have been attended by excellent results. The bark obtained bears comparison with the Java bark in every respect.

The production of essential oils, of tanning matter and of dye-stuffs has also received much attention.

Important experiments have been carried out in the cultivation of various kinds of maize, the best of which have already been distributed to European and native growers. Henceforward a greater development will be given to the cultivation of rice and, generally, to irrigated crops.

The laboratory of plant pathology has been very busy and every effort is being made to spread information as to the best means of controlling the diseases of plants, and insect pests. Manuring experiments are carried on, not only at the Amani station but also in private properties. The chemical laboratory has analysed a great number of soils and the employés of the station, at every request, visit private properties with the object of supplying practical information and advising as to the methods of cultivation which, in the experiments carried out, have been attended by success.

During the winter the course of tropical agriculture was attended by 24 farmers and 4 employés of the Station.

Consultations by letter have also increased very much. The station has answered 333 questions put by farmers asking for information on various subjects counected with agriculture, and beyond the limits of the Colony 72 items of information were forwarded to private enquirers and 151 to institutions.

At present the propaganda of the station is carried on by *Der Pflanzer*, a newspaper that is published at Dar-es-salam. More important publications are the " *Berichte über Land- und Forstwirtschaft für Deutsch Ost-Afrika* ".

Lastly, it may be mentioned that among the annexes of the Amani station there is a building for the accomodation of visitors; these are for the most part Europeans that have settled in the colony, students, and farmers and employés of the neighbouring English and Italian colonies.

WATTS, FRANCIS. **Experimental Work at the Botanic Station and Experiment Plots, Montserrat, during 1910-1911.** — *Imperial Dep. of Agr. for the West Indies. Report for 1910-1911*, pp. 1-22. Barbados, 1911. **618**

British W. Indies: Montserrat

The details of this Report as to the distribution of planting material from the stations show the existence of a diversified demand for plants in the island.

Over 18 000 plants have been distributed, 12 250 of which were of lime trees, and over 18 000 cuttings of sugar cane and sweet potato.

With a view to obtaining a race of cotton plants suited to local conditions and producing lint of good quality combined with high yield, the various types selected in the preceeding year were given comparative trials in the Experiment Station and the crop submitted to spinning trials.

The best results were obtained with the following varieties: Dagenham No. 4, Heaton No. 8 and 9, and St. Vincent No. 1. Practically all the cotton estates will have trial plots in 1912 planted with the best strains from the station, some 500 lb. of seed having been distributed.

Twenty-seven plots were devoted to cotton manurial experiments, including nitrogen, potash, phosphate and cotton-seed-meal series.

Efforts have been made during the last two years to collect all the varieties of sweet potato cultivated by the peasantry, with a view to their introduction into the trials with this crop in the experiment stations.

The results of the experiments so far show that some of the local kinds are heavy croppers, and are likely to prove useful additions to the collection.

A description has been made of all the varieties cultivated in the Station.

The characters considered were: colour of stem, colour of petioles, colour of venation, character of growth, colour of potato and colour of flesh (raw). These botanical characters are so far sufficient to identify correctly any variety of sweet potato.

The Ground Nuts trials are regarded as the most reliable trials yet conducted in Montserrat. The Carolina Running variety has given a yield of 1 706 lb. of cured nuts per acre. The method of determining the yield of cured nuts was to weigh the nuts as reaped and to deduct 35 % for loss on drying. Gambia, Spanish and Local have also proved to be very good varieties.

The experiments in the breeding of Indian corn were continued, and thirty progeny rows were grown in the Station. Each row was reaped and weighed separately and the best cobs from the heaviest cropping rows were kept for replanting. The actual yield was 36 bushels of shelled corn per acre.

A collection of seventeen sugar-cane varieties is maintained in the Station. An important section of the Station is devoted to recently introduced plants, the most important of which are Indian Fodder Grass (*Pennisetum cenchroides*), a Californian Grass (*Paspalum dilatatum*), Soy bean (*Glycine hispida*), Urd or Jerusalem pea (*Phaseolus trinervis*), Boia Medelloa (*Tephrosia candida* and *T. purpurea*), Bambarra Ground-nut (*Voandzeia subterranea*) and Yequie Manicoba Rubber (*Manihot dichotoma*).

AGRICULTURAL INSTITUTIONS.

614 The Agricultural Improvement Association of North Dakota. — *Farmer and Breeder*. Sioux City, Iowa, January 1912.

United States: North Dakota

This new association consists of North Dakota bankers, business men, and land owners, and has raised a fund of $300 000 to be expended during the next three years at the rate of $100 000 a year for the purpose of promoting agriculture in the State .

Plans are being perfected for conducting demonstration farms in various parts of the State, in localities representing the principal soil types, to be located so as to be of easy access to visitors from the surrounding territory. On some farms methods for the conservation of soil fertility will be studied; on others more and better live stock will be introduced with a view of demonstrating that the farmers all over the State would be greatly benefited if they would give more attention to diversified farming than they now do.

In certain sections such crops as clover, alfalfa, and peas will be grown. Much attention will also be paid to the production of corn and better varieties of oats, wheat, barley, and other small grain crops.

The farmers who are to co-operate with the association in this educational demonstration work are to carry on the work themselves, but the management of the land devoted to demonstration work, is to be under the direction of an expert furnished by the Agricultural Improvement Association.

This association is a private concern and donates this $300 000 fund for the good of the cause. This is the first large movement of its kind financed by private capital in the United States. Director Thos. P. Cooper, formerly of the Minnesota Experiment Station, will have charge of the work.

AGRICULTURAL SHOWS AND CONGRESSES.

New Zealand Shows. *The Pastoralists' Review*, Vol. XXI, No. 11, pp. 1209-1212. Melbourne, January 15, 1912. 615

The annual spring show of the Otago Agricultural and Pastoral Society opened in Dunedin on 29th November.

Of horses only Clydesdales were on view.

In the cattle section the total number of entries was 176, among them a number (61) of high class Ayrshires. The exhibit of Shorthorns was in all respects highly satisfactory. **New Zealand**

Competition was exceedingly keen and the judge had much difficulty in arriving at his decisions. In the Polled Angus section the noted Gladbrook stock at once assured the quality of the cattle exhibited. The Jersey cattle exhibit was only moderately good. The Holstein cattle entries were not numerous, and the competition not very close. The fat cattle section presented some fine-conditioned animals.

The show of sheep was splendid. The strongest sections were the Border Leicester and the Romneys. There were also some Shropshire Downs and in-bred half-breds.

There was a very fine display of pigs.

The Southland Agricultural and Pastoral Association's Show was held on 12th and 13th Dec. 1911. In the sheep and cattle sections the entries were large and the quality of the exhibits excellent.

In the latter section there were representatives of nearly all the breeds, Shorthorns and Ayrshires being particularly strong.

As a whole the sheep section was very good. The Border Leicester and Romney Marsh breeds were well represented and there was keen competition in almost every class.

616 FORGEOT, E. **Fattened Poultry: Competition Show at Bourg.** (Le Concours de Volailles grasses de Bourg). — *La Vie à la Campagne*, Vol. XI, No. 129, p 84. Paris, 1 Février 1912.

France For nearly fifty years, at the approach of Christmas in each year, a competition show of fattened poultry has been held at Bourg, in the Department of Ain.

Owing to the prizes offered by the State, the town of Bourg, the Agricultural Assembly, and the Departmental Society of Agriculture, the amount of poultry exhibited increases year by year. In 1911 there were 430 capons, 702 pullets, 280 geese, 215 ducks and 174 turkeys. The breeders of Bény, Treffort, Saint-Étienne-du-Bois and Meillonnas are well known for the excellence of their methods (especially as applied to the breed *Bressane à pattes bleues*) and always carry off the first prizes.

The birds are from 6 to 8 months old when they are exhibited. The fattening lasts from the beginning of November to the 15th or 20th December. The average weight is then from 6.6 lbs to 8.8 lbs for capons, and 5.5 lbs to 6.6 lbs for the hens.

The birds are crammed by hand, and the farmer's wife judges of the amount of food to be administered by the state of the crop. They are fed thrice a day, (morning, midday, and evening) on balls of paste made of the meal of maize and wheat mixed with milk. No drink is given, except sometimes a little milk. The cages containing the poultry to be fattened are covered as soon as they have been fed. The birds are carefully watched, as they may often get ill and die of indigestion or plethora.

The export from the above-named districts to London, Paris, and Brussels is constantly increasing, and reaches the annual figure of 1 300 tons.

International Prize-Competition for Rice-Desiccators, at Vercelli, Italy, in May 1912. (Concorso internazionale di essiccatoi da riso, a Vercelli, Italia, nel Maggio 1912). — *Il Giornale di Risicoltura*, Anno II, No. 3, pp. 44-48. Vercelli, 15 Febbraio 1912. **617**

Italy

At the time of the International Exhibition of Rice-Growing and Irrigation, to be held at Vercelli (1), there will be an international prize-competition for rice-desiccators.

The machines entered must be of one of the following classes:

1. Fixed machines, with minimum output of 20 tons of dried rice in 24 hours.
2. Fixed machines, minimum 10 tons.
3. Moveable machines, minimum 4 tons.

In all the classes, the desiccator must be capable of removing 20 % of water from the fresh rice.

Further information and programmes may be obtained from the " Associazione fra gli agricoltori del Vercellese ", Via S. Anna, 15, Vercelli (prov. Novara, Italy).

Agricultural Traction Engines in Algeria. (Essais de Motoculture en Algérie). — *Office du Gouvernement Général de l'Algérie*, XVIII Année, No. 4, p. 61. Paris, 15 Février 1912. **618**

Algeria

The Department of Agriculture is organising for 1912, from May 27 to June 15, in the districts of Sétif and Mitidja some test experiments in mechanical traction as applied to agriculture. They will, if possible, be continued in 1913 in Oran. They will be open to all constructors without distinction, and there will be no classification according to merit.

The Government General of Algeria, within the limits of the funds at its disposal, and following the order of priority of application, undertakes the transport to Algeria and back of machines intended for the experiments, from a French port to the station nearest to the place where the experiments will take place.

Applications will be received till 30 April 1912, by M. Stotz, Director of the Agricultural School of Maison-Carrée (Algiers), Commissioner General, who will reply to all requests for information.

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(1) See *B*. March 1912. No. 471. (*Ed.*).

CROPS AND CULTIVATION

AGRICULTURAL METEOROLOGY.

619 NERUCEV, M. **On the Estimation of Humidity in Agricultural Meteorology.** (Usloviia Organisazii Selsko-Khosiaistvennekh Meteorologhiceskikh Nabliudenii). — *Khosiaistvo,* VII oi G. Isdania No. 4, pp. 89-95. Kiev, 26 Ianvaria 1912.

Russia

To determine whether there is a direct relationship between the quantitative value of the harvest and the total rainfall as registered by the raingauge, observations were made on fields of wheat sown in March at Elisavetgrad under the care of Presikov, and they lasted over a period of eleven years. The results are given in the following table; the spring rains, owing to their importance, are also given in percentage of the total rainfall.

Year —	Rain inches	Spring rain inches	Spring rain in percentage of total rainfall	Yield in cwts. per acre
1879 . .	26.5	8.6	32.3	3.15
1886. . .	19.4	2.4	12.4	3.63
1887. . .	16.3	4.3	26.2	7.47
1889. . .	18.5	7.6	40.8	2.46
1891 . . .	21.4	4.7	22.0	4.43
1895 . .	17.3	2.7	15.3	6.09
1898. . .	13.1	3.3	24.3	6.69
1902. . .	14.4	4.2	29.0	3.82
1903. . .	14.5	2.5	17.8	7.88
1904. . .	9.2	3.5	38.2	4.66
1909. . .	14.9	3.3	21.9	8.38
Average .	16.9	4.3	25.3	5.34

In these eleven years there are five with harvests above the average, namely 1909, 1903, 1887, 1898, and 1895; in these the rainfall averaged 14,9 in., of which 3.2 (21.5 %) fell in spring; the crop averaged 7.3 cwt. There were six years with harvests below the average, namely, 1904, 1891, 1902, 1886, 1879 and 1889; in these the rainfall averaged 18.3 in., of which 4.2 (28.3 %) fell in spring; the crop averaged 3.7 cwt.

It will be seen that the rainfall and its distribution provide the most favourable conditions for the wheat precisely in those years when the harvest was scanty.

This shows that it is as a rule impossible to draw absolute conclusions based on the value of a single factor.

Here is an item which, although registered in meteorological tables, is almost always neglected both as regards itself and as regards its relation to the other items. This is the evaporating power of the soil and of plants, which is often two or three times as great as the atmospheric precipitation. Thus for the Experiment Station of Plotiansk we find a total rainfall of 16.3 in., with an evaporating power of 32.5 in., and for the Agricultural School of Lukianov, 13.75 in., and 37.3 in. respectively.

It is clear therefore how this factor must be regarded in calculating the balance of moisture in the soil available for plants.

Zebediev has been led by his investigations to the opinion that the aqueous vapours which condense on the ground are of much importance, as they increase the reserve of sub-soil water.

Consequently in studying the action of moisture on plant life, it is necessary to examine the conditions, which by accelerating or retarding the processes of condensation, determine the circulation of aqueous vapour from the soil to the surrounding atmosphere, and again from the latter to the soil.

620

HUDIG, J. **The Amounts of Nitrogen as Ammonia and Nitric (and Nitrous) Acid in the Rain-water collected at Uithuizermeeden. Groningen.** — *The Journal of Agricultural Science*: Vol. IV, Part 3 pp. 260-269. Cambridge. January 1911.

Netherlands. Great Britain

The nitrates were determined according to the following method worked out by miss Huizinga. The results of the analyses of the rain-water collected with the pluviometer during 1909, are given in the following table, (the article contains also another table showing the results of analyses for the period July 1908 to December 1910):

1909	Rainfall		Nitrogen per million		Rainfall × nitrogen p. p. m.	
	mm.	inches	as ammonia	as nitrates and nitrites	as ammonia	as nitrates and nitrites
January-April .	164	6.44	0.840	0.239	137.8	39.2
May-June . . .	88	3.45	0.980	0.281	86.2	24.7
July	97	3.81	0.607	0.214	58.9	20.6
August	123	4 83	0.327	0.167	40.2	20.5
September . .	94	3.69	0.187	0.167	17.6	15.7
October	67	2.63	0.840	0.254	56.3	17.0
November . .	82	3.26	0 653	0.154	53.5	12.6
December . . .	109	4.28	0.280	0 248	30.5	27.0

In general it may be said that the concentration of nitrogen is to a certain extent inversely proportional to the rainfall. It will be seen that in May, June, July, and August 1909 the decrease of ammonia and the incaease in the rainfall are rectilineal. In this case the nitrogen concentration seems to be directly proportional to the amount of rain-water. When calculating the amount of ammonia precipitated by rain per month expressed by the product of parts per million nitrogen and rainfall in mm., it is seen from above table that these products are still variable. This proves that the amount of atmospheric nitrogen bronght down by rainfall is not *only* dependent on the amount of rain, but is influenced by other meteorological conditions.

In representing graphically the amount of rainfall and the amounts of nitrogen as ammonia and as nitrates (and nitrites) precipitated during the different months, an inverse relative proportion is shown by the first two curves (rainfall and NH_3-N) while the third (NO_2N) is fairly horizontal.

A graph of the average monthly amounts of nitrogen as ammonia in Rothamsted rain from 1888-9 to 1900-1 shows a similar inverse relative proportion, but in a less degree. Miller (*The Journal of Agricultural Science*, Vol. I. 283, Table II) shows from the Rothamsted data that the concentration with low rainfall is always higher than with high rainfall. With a mean raiufall of 0,65 in., the rain-water contained 0.965 nitrogen as ammonia and 0.442 nitrogen as nitrates, whilst with a mean rainfall of 4.92 in., the amounts were 0.278 and 0.124 respectively. These data correspond well with Mr. Hudig's experience. There is however no such relation between the total amounts of nitrogen and rainfall.

The relative proportion between nitrogen as ammonia and nitrogen as nitrates (and nitrites) calculated as an average is

0,724 p. p. m. to 0,237 p. p. m. or.
75.3 % to 24.7 %.

This proportion corresponds well with the Rothamsted and other data. The rain-water collected with the pluviometer represents a monthly average of individual samples of fluctuating composition. To obtain a better knowledge of the latter, the writer sampled rain-water by means of a funnel of 1 m. diameter, placed in a bottle holding 20 litres. A sufficient sample was thus collected from a single shower. The composition of the rain was very variable. In some cases there seems to be a relation between the composition and the meteorological conditions under which the rain-water was sampled. For instance, the ammonia percentages were high, with some exceptions, when the samples were collected during thunderstorms; but under normal conditions they were not high. In samples taken on successive days the concentrations did not usually differ much.

The relative proportion between ammonia and nitrates calculated as an average was:

0.565 mgr. : 0.182 mgr.
75.6 % : 24.4 %.

It is noteworthy that this relative proportion corresponds quite exactly with that found by the gauge-observations, though they differ in absolute value.

	Nitrogen	
	as ammonia	as nitrates and nitrites
Sample from rain-gauge as a mean . . .	0.724 mgr.	0.237 mgr.
» » funnel » » . . .	0.565 »	0.182 »

The mean rainfall in the Netherlands (since 1852) is about 700 mm. (27.51 in.). Assuming the average composition of the rain-water to be the same as has been calculated from the gauge-observations — ·724 mgr. of N as ammonia and ·237 mgr. N as nitrates per litre or 0.961 total nitrogen — the soil only receives 6.73 kg. (14.80 lbs.) of nitrogen per hectare (2.4711 acres) per annum.

It has been shown by Liebscher, (*Verslagen van landbouwkundje onder-zoekingen der Rijkslandbouwproef-stations*, No. X. 911) and other investigators, that for cereals there is only one period which is significant for the assimilation of nitrogen. This period may be roughly marked out from about some weeks after the germination to the earing-stage; it lasts for almost 50 days. Thus it will be evident that from a manuring point of view the atmospheric combined nitrogen is of little importance.

621 HOFMANN, K., and HANSEN, J. **Meteorological Observations at the Experiment Station of Dikopshof, Bonn-Poppelsdorf.** (Die Witterung). *Zweiter Bericht vom Dikopshof, Erster Abschnitt*, pp. 1-6. Berlin, 1911.

Germany

The first chapter of the second report of the Experimental Station, Dikopshof, attached to the Royal Agricultural Academy of Bonn-Poppelsdorf deals with the meteorological observations made there in 1908 and 1909.

The course of the weather in these two years was very different, and was reflected in the sharp contrasts presented by the crops as regards their quantity and quality.

In 1908 the spring was cold and wet, with abundant, but unequally distributed, rain, in March and April. February had been relatively mild, with normal rainfall. May, June and July showed a relatively high temperature. The heavy rains and low temperature which began in August lasted till the first third of September, after which fine autumn weather set in and lasted till the end of October, during which period only 2.2 mm. (0.09 in.) of rain fell.

The cereals gave as a whole an unsatisfactory yield.

In 1909 the winter was unusually severe for Rhine districts, the mean temperature for January being —1.3° C. (29.6° F.), and for February —1.5° C. (29.3 F.).

The spring was late and the summer very wet, the only months relatively dry being May and June. The consequence was that the forage and beet crops suffered, while the grain harvest was unusually good.

622 MERCANTON, P. L. and VAN UFFORD, QUARLES. **Electric Niagaras** (1). (A propos des Niagaras électriques). — *Procès-Verbaux des Séances de la Société vaudoise des Sciences naturelles* No. 4, Séance du 7 Février 1912. Lausanne.

Switzerland

The electric Niagaras of Messrs. de Négrier and Beauchamp are nothing else but great lightning conductors, and are supposed to be able, like the hail preventers of 1825, from which they are derived, to discharge the electricity with which storm-clouds are laden. Messrs. Négrier and Beauchamp while laying down as a principle that the formation of hail is due to the accumulation of electricity in the clouds, consider that the five " Niagaras " of the Vienne district, each 40 metres (150 feet) high and erected at a distance of 10 km. (about 6 miles) from each other will afford efficient protection.

M. Mercanton, among others does not place much faith in the efficiency of " Niagaras " and is of opinion that the results hitherto published should only be accepted with a prudent reserve. He is confirmed in this attitude by the history of the various attempts at protection against hail, and thinks that the hopes founded on the use of " Niagaras " are too slender and the apparatus too expensive to warrant the Canton of Vaud in adopting this method of hail control which has not even the merit of originality.

In this connexion, M. Quarles van Ufford recalls the but little known experiments of Prokop Divisch, curate of a small village in Bohemia who devoted his leisure time to the study of natural science especially of electricity. In 1754 he erected a lightning conductor consisting of an iron rod, one extremity of which communicated with the underground water and the other bore some horizontal arms supporting iron boxes studded with iron spikes and filled with iron filings. The whole apparatus was about 40 metres, (150 feet) high.

Several times Divisch was able to test the usefulness of his lightning conductor. He observed that the storms dissolved on approaching it, and that hail, frequent in the neighbourhood, spared the locality in which the apparatus stood. In spite of this benefit, Divisch met with no success ; all the unfavourable meteorological phenomena which happened, such as the absence of snow, very cold winters, etc. were attributed to his apparatus, and at last the neighbours, believing that Divisch sent them the hail which otherwise would have fallen on his land, destroyed his apparatus which was never reconstructed. Divisch's idea, however, has either been taken up again or it has independently occurred to other workers in the same field, and, in a somewhat modified and improved shape it underlies the present French " electric Niagaras ".

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(1) See *B*. Nov.-Dec. 1911, No. 3107.

AGRICULTURAL GEOLOGY.

628 KOSSOWITSCH, P. **The Black Soils.** (Die Schwarzerde). — *Internationale Mitteilungen für Bodenkunde*; Band I, Heft 3-4, pp. 199-355. Berlin, 1912.

Russia

The black soils, from their extent and fertility, their stratigraphical importance, and richness in humus, have for a long time attracted the attention of pedologists, agriculturists and botanists. The " tschernosióm " occupies nearly all South European Russia and part of West Siberia, passing over in the north to grey forest soil and in the south to chestnut-coloured soil (Kastanienboden).

The climate in the district occupied by the black soils is continental and is characterised by: insufficient rainfall, dryness of the air, hot summers (mean 17 to 20° C.) and severe winters (mean —4 to —12° C.).

Two factors contribute to the aridity of this soil:

a) The rain comes down in the form of heavy showers, and the water has no time to penetrate into the ground, but runs off at once into the depressions and rivers.

b) The chief atmospheric precipitation is in the summer, when the water is at once taken up and used by the vegetation. The dryness of the soil renders the process of leaching very feeble, thus excluding the growth of trees, and causing the flora to present the characteristics of steppe vegetation, with a predominance of Gramineae, which are capable of resisting the saline nature of the soil.

The black soils are formed under the most varied lithological conditions. In the central portion of European Russia, the subjacent rock is Russian loess, which is fine in texture and rich in calcium carbonate. Further north, the subsoil consists of moraine clay; in the south, the black soils rest upon red-brown clay; in the southeast, on variegated saline clays and upon the sandy strata of the Aralo-Caspian sea. In the Transcaucasus, the " tschernosiom " is formed from the weathering of crystalline rocks, *e. g.* olivine-basalts.

Although the rocks to which the "tschernosiom" owes its origin differ so much in origin and in composition, yet they have certain common characteristics; porosity, richness in calcium carbonate, a tendency to perpendicular cleavage, the occurrence at certain depths of accumulations of gypsum and soluble salts (sodium chloride, sodium sulphate, etc.). These facts all tend to prove that the uniformity of the subsoil is the result of the process of the formation of the tschernosiom. Thus, in the northern part, where the subsoil consists of moraine clay, this is superficially somewhat changed, assuming the appearance of loess.

The Process of Tschernosiom Soil formation. — The composition of the soil and the subsoil does not substantially differ. The soil is richer in humus, nitrogen and phosphoric acid and poorer in lime, magnesium, and carbonic acid. The mechanical composition of both is similar.

The processes of leaching, which are relatively feeble, extend to considerable depth (more than two metres, 6 ft. 6 in.) with the accumulation of easily soluble salts, such as chloride and sulphate of sodium, these salts being wanting on the highest strata. Carbonates of magnesium and of calcium are deposited at a depth of 1—2 metre below the humus stratum, a little above the gypsum horizon. No removal of the finest particles of clay alumina or iron-oxide from the upper strata is observed, because in the formation of the tschernosiom, conditions were not favourable to the transport of substances in a colloidal condition.

The formation of the black soils was accompanied by a large accumulation (up to 16 %) of humus. The conditions which brought about this accumulation were as follows:

1. The large annual formation of masses of organic matter due to the rich vegetation which forms owing to the abundance of nutritive substances in the soil of the steppe, which has been little subjected to leaching action.

2. Want of sufficient moisture to promote the rapid decay of organic substances.

3. The high content of the parent rock in calcium and magnesium, which contributes to the formation and preservation of the humus in the soil. The formation of the black soils is therefore chiefly characterised by negative reasons; absence of leaching, with however no injurious accumulation of soluble salts, and a very high percentage of humus.

Morphological Characters of the Tschernosiom. — 1. *Colour.* — The main colour of these soils is black, but a gray shade is clearly to be distinguished where the damper portions of the forest-steppe zone appear, and a grayish chestnut-colour where the black soils of the driest districts alternate with chestnut soil.

2. *Composition.*—The surface is usually covered with a layer 2-4 cm. deep of a thick felt formed of rootlets mixed with a grayish dust derived from plants, sand and fine mineral particles. Beneath this (in virgin soil) occur two strata in vertical succession:

a) A dark uniformly coloured humus stratum 30-60 cm. deep and formed of small lumps having a diameter of 2-4 mm.

b) A much coarser and less homogenous layer which passes inperceptibly into the subjacent rock.

Classification of the Different Types of Tschernosium.—The black soils are classified under different heads according as to how far they express the characteristic method of formation of the type.

They may thus be divided into three groups.

1. Typical tschernosiom.
2. Chocolate-coloured or chestnut-coloured soil showing the characteristics of a desert-steppe formation.
3. Gray tschernosiom of the forest-steppe zone with the characteristics of the "Podsol" formation.

Mechanical Composition of the Various Types of Tschernosiom.—The data obtained by means of chemical analyses, according to the method of Schöne and Osborn, permit of the following groups being distinguished.

1. A compact-clayey black soil containing over 40 % of clay particles (diameter below 0.01 mm.).

3. A clayey black soil in which the particles below 0.01 mm. are between 25 and 35 %, and the silt (0.05-0.01) amounts to 50 % and over.

3. Light clayey black soil. Clay particles 20 %.

4. Loamy black soil; percentage of clay particles not exceeding 10 %.

Physical Properties of the Black Soils. — The writer, besides giving a large number of data, enters into a minute discussion of the physical properties of the Black Soils based on his personal observation, and on the works of numerous authorities.

The following table refers to the different groups of the Black Soils.

Physical Properties of the Tschernosiom.

Character of the Tschernosiom	Spec. Grav.	Weight of one litre of soil in gr.	Pressure Resistance in gr.	Height to which water rises in cm. after								Time necessary for water to rise to a height of 30 cm.	Time necessary for water to penetrate a stratum 18 cm. thick	Water capacity of Soil	Greatest hygroscopicity per 100 gr. of dry soil	Hygroscopic water in air-dried soil
				10 Minutes	20 Minutes	30 Minutes	1 Hour	3 Hours	6 Hours	12 Hours	24 Hours	h. m.	h. m.			
Loam (from plateau) . . .	2.330	1 152	2 450	4.6	6.2	6.8	—	—	20.6	28.3	—	14.25	16.15	55.35	9.0	4.11
Sandy loam	2.562	1 314	1 500	8.5	11.0	10.8	—	—	—	—	—	4.35	6—	40.40	5.8	2.7
Rich, over loess-like loam .	—	—	—	4.2	5.3	6.2	7.9	11.9	15.8	20.8	26.7	33—	3—	—	—	—
Loam (on gentle slopes) . .	2.570	1 246	2 349	3.0	4.8	6.2	—	—	14.4	—	—	19.10	3.11	36.46	3.6	—
Sandy loam (from *stipa*-steppe)	2 500	1 205	—	7.5	9.5	11.3	14.5	—	—	—	—	—	0.23	48.16	—	4.90

Chemical Analysis of the Tschernosiom.

Type of Tschernosiom	100 parts of dry soil contain												
	Humus	Water in chemical combination	SO_3	CO_2	P_2O_5	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	Total
Loam (from plateau)	3.45	1.55	0.11	0.02	0.12	81.47	7.16	2.14	1.01	0.55	1.86	0.88	100.3
Heavy (from plateau)	7.84	2.87	—	—	0.28	64.40	13.12	4.62	1.41	1.58	2.22	1.33	99.7
Chestnut-coloured	4.66	3.74	—	—	0.15	65.90	13.12	5.50	2.15	1.88	2.21	0.51	99.8
Chocolate-coloured	4.03	3.94	—	0.19	—	64.85	15.61	4.00	1.94	1.49	1.98	0.92	99.0
Light loam.	7.93	2.76	0.33	—	0.45	55.57	19.81	5.10	1.57	1.62	2.13	1.68	100.0

Agricultural Properties of the Tschernosiom. — These soils, from their chemical composition, and their physical properties, are exceedingly well adapted to agricultural requirements. In spite of their fine structure, their characteristic granular nature permits of free passage to water and air alike.

Their richness in humus and clayey particles allows a considerable amount of water to accumulate in the superficial layers, and the granular structure prevents any stagnation. All the observations made, show that the productivity of these soils would be quickly reduced if their structure were altered by exaggerated and mistaken methods of working it. The black soils are rich in nutritive substances, and retain their fertility for many centuries. This is accounted for by their physical properties, which favour weathering, by the characters of the parent rock, and by the slightness of leaching. Another point tending to preserve the fertility is that years of heavy crops alternate with years of poor ones, in which little nutriment is removed from the soil.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY.

PISKUNOV, D. **The Effect of Topographic Conditions on the Development and Yield of Cultivated Plants.** (Vliianie Topographiceskikh Uslovii na Rasvitie i Uroxai Kulturnekh Rastenii). — *Sapiski Novo-Aleksandriiskago Instituta Selskago Khosiaistva i Liesovodstva.* (Journal of the Institute of Agriculture and Forestry at Novo-Alexandria), XXII Tom, 1 Vep,, pp. 46-100. S. Peterburg, 1911. **624**

Russia

The writer gives the results of many interesting investigations carried out for the purpose of determining the action of the topographical factor on the growth of wheat, flax, and lupins, in the experiment field of the Agricultural Institute of Novo-Alexandria. He shows how the conditions of position act directly on the life of cultivated plants, and demonstrates for the above-named crops what had been already laid down by Voln for turnips, and by Petroff and Maidanik for sugar beets.

Plants of different species behave differently under equal conditions of growth. Thus, wheat and flax do best on flat ground; on land with steep slopes, they show a marked preference for those facing the West or North. The worst position for wheat is a slope facing south; for flax a slope facing east.

Lupins prefer uneven ground, and their best position is on slopes facing south (the worst for wheat), or east (the worst for flax). These differences depend on the plants' nature and especially on their root systems and on the way in which the latter re-act to the moisture, the temperature, and the light during the period of their growth. The plants with fine filamentous roots (wheat, flax) do badly on any kind of slope through want of water, which runs off all the more rapidly, the greater the quantity, and the steeper the slope. Flax especially, whose roots grow near the surface, suffers from the want of moisture, above all in places where, at the time of its maximum growth, the surface of the ground is driest, a thing which always happens on slopes facing east.

On the other hand the slender roots of wheat grow downwards to a considerable depth, hence the worst position for this plant is where the whole ground (not the surface only) is driest; and this happens on slopes facing south.

As regards flax, the general look of the plants, and the percentage of seedlings, show how a slope facing west, provides the best conditions of moisture and temperature, and how flax, when at its maximum daily growth, can get on with diffused light alone. Whereas wheat is not exacting as regards temperature and light, and does best on northern slopes.

The case is very different with plants like lupins, which have a large, well developed root system. They can reach the moisture far down in the soil, where the sun's evaporating power does not reach, at least during the first period of their growth. Hence they do best on southern slopes in the full morning sunlight.

On level ground, where there are varying conditions of moisture, temperature, wind, and light, the best results are obtained in low and sheltered positions. The only drawback is that wheat and flax may suffer from the sun's excessive power, and lupins from cryptogamic diseases.

In open high land growth is slow and incomplete. In the case of wheat and lupins the yield is scanty, while the flax harvest is abundant, but of very inferior quality.

From the above it is clear that flat ground as a rule provides the best conditions for the growth and yield of crops.

Those plants which require the sun, and which have strong well developed root systems, do best on slopes facing south or east, while on slopes which have the direct sun only in the afternoon they do not prosper.

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION.

Irrigation in France. — *Annales de l'Hydraulique et des Améliorations agricoles,* fascicule 33, pp 46-96 et fascicule 34, pp. 348-351. Paris, 1905 et 1906. 625

HITIER, M. — *Bulletin de la Société d'Encouragement pour l'Industrie nationale,* 111e année, T. 117, No. 1, pp. 110-126. Paris, Janvier 1912.

MÜNTZ, E. et LAINÉ, E. — *Comptes Rendus hebdomadaires des séances de l'Académie des Sciences,* T. 154, No. 8, pp. 481-497. Paris, 19 Février 1912.

I. — IRRIGATION IN PROVENCE.

In Provence irrigation plays a most important part in the utilization of the natural wealth of the soil. Especially the early crops, fruit, vegetables, seeds and flowers are irrigated. Lucerne and meadow grasses are also watered. **France**

A) MEADOWS IN THE CRAU DISTRICT. — The great gravelly plain of la Crau, about 130 900 acres in extent is bare of vegetation except where irrigation is practised. In the parts supplied with water from the Durance, which is conveyed by the Craponne, Alpines and other canals, fine meadows are to be seen even during the hottest months.

Irrigation is carried out from the 1st of April to September 30; every week from 5 to 10 cm. (2 to 4 inches) of water are used, which means about 13 000 to 26 000 mc. per ha. (185 900 to 371 800 cub. ft. per acre) during the season. Under these conditions three cuts are made which yield 7 500 to 8 000 kg. per hectare (60 to 64 cwt per acre) of dry hay. These results, however, are not obtained without the use of fertilisers also; in one year 12 tons per ha. (96 cwt per acre) of sheep dung are given, and in the next, artificials, consisting of 600 to 700 kg. of superphosphate and 100 to 150 kg. of sulphate of ammonia per ha. (4.8 to 5.6 and 0.8 to 1.2 cwt. respectively, per acre), and so on alternately.

The hay is mostly exported.

All the large estates of la Crau possess baling machines which allow the hay to be pressed into bales which are then sent, not only to Marseilles, Arles, and Lyons, but even to Alsace and abroad. 7 500 kg. of hay per hect. (60 cwt per acre) give 500 to 600 fr. per hectare (£8 to £9.12*s.* per acre) gross returns, and it will be readily understood that whereas in la Crau unirrigated lands are let for 10 fr. per hect (3*s.* 2 ½*d.* per acre), irrigated meadows command 150 fr. (£2.8*s.* per ac.).

To form a meadow, the land is first protected by cypress hedges, then it is broken up and the surface is prepared for irrigation by being divided by water channels into strips about 50 metres (162 feet) wide. Lucerne which forms the basis of the meadow is generally sown, in October, in wheat, together with other grass-seeds. The meadows last many years; in winter from November to February they are grazed by the flocks of sheep which descend from the Alps where they spend the summer, and if the Crau farmer has not enough sheep of his own he lets part of his meadows to his neighbours at the rate of about 60 fr. per ha. (19*s.* 2*d.* per acre) for winter grazing.

B) IRRIGATED CROPS IN THE DURANCE PLAIN. — In the Durance plain, market gardens and meadows are irrigated. A great portion of the necessary water is supplied by the Carpentras Canal, which affords a striking example of the changes wrought by irrigation in the agriculture and general prosperity of a district.

The Carpentras Canal. The main canal is 89 kmet (about 53 miles) long, the secondary canals are 58 kmet (about 35 miles) and the total length of the supply ditches is 673 kmet (about 404 miles). The whole canal cost 4 700 000 fr. (about £186 000). The amount of water supplied by the canal at its lowest water mark is 6 cub. m. (211 cub. ft.) per second. An association of land owners exploits the canal, which is managed by a board of 11 members; the technical direction is conducted by an engineer who has under him one foreman, 9 sergeants and 48 guards. The land which can be irrigated by the canal is 16 600 ha. (41 000 acres) in extent; it is composed of gravel and of reddish sand, and was originally either bare or covered with some vineyards and stunted oaks.

These lands are generally porous and warm, and they utilise water rapidly and yield high returns. The extent of land belonging to the members of the association is about 5460 ha. (13 486 acres), but the ratio of the irrigated surface to the total was for a long time very low; 20 % in 1860; 43 % in 1880; 64 % in 1903; 76 % in 1910. The increase of the extent of the irrigated surface become general after 1903, in which year the irrigation Regulations were extended to the whole network of the canal. According to these regulations, which take into due consideration the varying needs of the farms (nature of the soil and of the crops), the water is given in some cases once every 3 3/4 days, in others every 4 1/4, 5 1/4, 6 1/4, 7 1/2, 8 1/2, 10 1/2 and 12 1/2 days.

However much the intervals between the waterings may vary, each plot receives the same amount of water per unit of area. (During the year 1910 this amount corresponded to a theoretical continuous flow of 1.25 litres per second and per hectare (0.178 cub. ft. per second per acre) (1).

Price of irrigation water. Two rates are levied: one, for the upkeep of the canal, which amounts to 3 fr. per hectare (11.56*d.* per acre) and is paid for all the 5460 hect. (13 486 acres) of land represented by the association, the other 32 fr. per hect. (10*s.* 2 3/4 *d.* per ac.) is paid only for the land which is irrigated.

Irrigated Crops. The 4 100 ha. (10 127 ac.) which are irrigated, belong to 7 600 farmers and bear the following crops:

Natural pastures .	1 657 ha.	(4 093 acres)	Strawberries.	763 ha.	(1 885 acres)
Grass leas	339 »	(837 »)	Gardens . .	102 »	(252 »)
Annual Crops. . .	1 144 »	(2 826 »)	Vineyards .	95 »	(235 »)

Irrigation competitions. The Carpentras Agricultural Society, in consequence of the continuous increase of irrigation, has organised a competition among the land-owners and farmers of the district. This competition has had the result of showing the rich and varied produce that can be obtained from irrigated lands. This is also shown by the high prices that such lands fetch in the market, namely from 4 000 to 7 000 fr. per ha. (£64 to £102 per ac.). The small number of farmers is also worthy of notice; of the 120 persons who entered for the competition only 42 were farmers, as against 78 owners, and it may be taken for granted that these 42 farmers hope soon to become owners.

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(1) This is the theoretical amount during the whole period of irrigation which is 183 days (from April 1 to October 1), and it corresponds to about 19 600 cub metres per hect. (280 280 cub. ft. per ac.), which is distributed to the various crops in a certain number of actual waterings.

This theoretical amount in used in France as a measure for the payment of the water supplied. In the United States and in Canada the quantity of water supplied is measured by the height which it would attain if given to the soil at one irrigation, and without losses of any kind. See *B.* March 1912, No. 487 — *Irrigations et Drainages* par RISLER et WERY, pp. 279-280, Paris 1909. (*Ed.*).

Cultivation of Strawberries at Carpentras (1). Among the most remunerative crops of the Carpentras district strawberries rank high. The production of this fruit, which in 1888 was 210 000 kg. (206 tons) rose in 1905 to 3 400 000 kg (3 246 tons) The rights of irrigation, which formely were worth 70 to 80 fr. per ha (22*s.* 4 3/4 *d* to 25*s.* 7*d.* per acre) vary now between 500 and 600 fr. (£8 to £9.12*s.* per ac.) again showing the connexion between irrigation and the prosperlty of the country, Strawberries are irrigated from the middle of March to October. Before the harvest they are watered twice a weck, afterwards only once. In Mr. Batailler's farm at Monteux, 270 ares (about one third of an acre) are under strawberries, the land is divided into beds 120 metres (390 ft.) long with a fall of 0 50 m. (19 ½ inches) or about 4 per 1000. At the higher extremity of the bed the supply ditch in situated, it is built of cement and bordered by a foot path. The water outlets, 10 metres (32 feet) apart are provided with metal sluice-salves, and stoneware conduits for the crossing under the foot-paths. The installation expenses amounted to 3 000 fr per ha (£48 per acre) the working expenses are about 2 500 fr. per ha (£40 per ac.) per annum, and the yearly profit 2 800 fr (£44 16*s* per acre).

II. — SCIENTIFIC RESEARCH ON THE FREQUENCY OF IRRIGATION AND AMOUNT OF WATER TO BE APPLIED, ACCORDING TO THE NATURE OF THE SOIL

The want of success which has attended some irrigation schemes has not been due, as some believe, to the quality of the water employed, but to the physical nature of the soil, and chiefly to its degree of permeability. Thus the prosperity of the region served by the Saint Martory canal which starting from the Pyrenees reaches as far as Toulouse, has actually decreased since the opening of the canal. This is due to the low permeability of the soil which only partially absorbs the water it gets, and thus becomes swampy. Similarly the area watered by the Bourne canal on the left bank of the Rhône, below the Isère, reaps but little benefit from the water it receives.

The soil is extremely permeable and water sinks into it, hardly wetting the surface for which it is intended. It follows that the study of the physical properties of the soil should form part of every preliminary survey, so as to ascertain in the first place whether the making of a canal would be beneficial, and then the volume of water to be brought, the duty and the mode of distribution to be adopted.

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(1) See *B* January 1911, No 151; May 1911, No 1428; August-September-October, 1911, Nos 2652, 2655, 2656 (*Ed*)

Irrigation water is conveyed by laterals to the land it is to supply. The amount of water flowing from these is successively placed at the disposal of the various farmers, during a certain time, and proportionally to the area to be watered. To ensure the highest duty of the water it is necessary to calculate with precision: 1. the amount of water forming the unit of irrigation; 2. the length of time each watering employs, which with the unit, determines the volume of water used; 3. the interval of time between each watering of the same plot, which interval limits the surface watered by the lateral.

Precise data for these calculations are rarely in the possession of the engineers entrusted with the preparation of irrigation canal schemes; and they mostly apply the same uniform rules for soils of different natures. During the last years Messrs. Faure, Müntz and Lainé have devoted themselves to the scientific determination of these data. The problem is very complex; and up to now it has only been studied in connexion with meadows and with irrigation by owerflow channels. The experimenters have established numerous experiment fields in different types of soil and in districts where irrigation has long been practised. They have examined the physical nature of the soils; they varied the volumes of water and the intervals of time between successive waterings and determined the influence of these variations on the crops.

Different soils may be classed according to their permeability; for this a scale has been drawn up, in which each degree corresponds to 1 centimetre (0.3937 inch.) of water absorbed in one hour. By means of this scale the various experiment fields have been classed as follows:

Stations	Permeability
Fourcadel	0.05 to 0.19
Ondes	0.60
Cavaillon	2.00
Carpentras	3.10 to 12
Valence	50 to 60

In each experiment fileld determinations were made: 1. on the optimum quantity of water for the yield of the crops, when the interval of time between successive waterings was the same; 2. The influence on the crops of the same total amount of water, but distributed in more or less frequent waterings.

Amount of water to be applied at one time. In each experiment field 4 plots or " calants " (1) were prepared and irrigated as long as was necessary for the water to reach the lower end of each plot. The time required was carefully noted, and thus the minimum volume of water capable of watering a given surface was ascertained. This volume varies with the physical nature of the soil as the following table shows:

Stations —	Permeability —	Number of cub. met for 1 ha	Number of cub ft. for 1 acre
Fourcadel	0.05 to 0 1	150	2 145
Ondes	0 60	350	5 005
Cavaillon	2 00	360	5 148
Carpentras . . .	3.00	460	6 578
»	10 00	570	8 151
»	12 00	550	7 860

The above quantities of water being taken as a unit, at every watering, plot no. 1 received this volume, plot no. 2, one and a half times as much; plot no. 3, twice as much; while plot no. 4 was not irrigated and was kept as control.

The following are the yields of dry hay in kilogrammes (2.2 lb.) per hectare (2.47 acres) for the last three years. The figures for Fourcadel and Ondes refer only to the two last mowings.

Stations —	Permeability —	With 1 vol. kg.	With 1, 5 vol. kg.	With 2 vol. kg.	Control, without irrigation kg.
Fourcadel . . .	0.05 to 0.1	3 930	—	—	1 345
Ondes	0.60	4 189	3 870	3 897	700
Cavaillon . . .	2.00	12 842	13 390	13 090	5 666
Carpentras . .	3.00	13 712	14 030	12 890	2 677
» . . .	10 00	14 247	11 699	13 277	4 762
» . .	12 00	13 123	13 149	12 030	5 411

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(1) Irrigation by " calauts " is a method which can be advantageously employed in plains having a regular slope between 1 per 1000 to 2 per 100. This method consists in opening, obliquely to the contour lines, supply ditches having a section which delivers the unit of volume adopted for irrigation. These ditches are situated 10, 20 and 60 metres (32 ft 6 in , 65 and 195 feet) apart, according to the permeability of the soil. The space between them is divided into plots, called " calants ", 10 to 15 metres (32 ft. 6 in. to 48 ft. 9 in) wide, by means of little embankments 1.50 metres (5 ft 3 in.) wide and 0 10 metres (4 inches) high. These embankments spread the water uniformly and do not hinder the passage of agricultural machines. See *Irrigation et Drainages* par RISLER et WERY, p. 218, Paris 1909. (*Ed*)

Watering with one volume is thus the most advantageous. If in some cases a greater yield was obtained by more copious irrigation, the increase was not proportional to the greater amount of water. Any excess constitutes a loss of water which might be injurious or might be utilised on other areas; besides, by flowing away in the drains, it impoverishes the soil. This point is of the highest importance for utilizing to the utmost irrigation water.

Frequency of irrigation. The greater or lesser frequency of waterings influences the yield of hay, as may be seen from the following table, in kilogrammes and hectares, in which the figures for Fourcadel and Ondes refer only to the two last mowings:

		Yield per hectare, watering every				Control without watering
Stations	Permeability	3 3/4 days	7 days	15 days	22 ½ days	
-	—	kg	kg.	kg.	kg.	kg.
Fourcadel . .	0.05 to 0 1	4 075	3 930	3 600	2 410	1 375
Ondes	0.60	3 460	4 287	3 820	2 400	710
Cavaillon . .	2.00	12 827	13 541	11 939	12 005	5 721
Carpentras . .	3.00	13 888	13 680	11 026	9 662	3 340
» . .	10.00	15 578	13 882	12 201	10 086	4 429
» .	12.00	12 978	12 078	11 246	8 413	4 009

The above clearly shows that though the most frequent watering often increased the yield, this increase is neither sufficiently important nor regular to pay the extra labour. Generally, one irrigation every 7 or 8 days, is the most advantageous. Less frequent watering diminuishes the yield considerably.

Continuous flow. When the volume of water employed for each watering and its frequency are known, the total quantity of water required during the whole season (April 1 to October 1) may be easily calculated. If this volume be reckoned per unit of surface, the hectare (2.47 acres), and of time, the second, the theoretical *continuous flow* is obtained. According to the experiments made this flow ought to be in litres (0.0353 cub. ft.):

For Fourcadel, 0.23 litres instead of 0.75 as according to the regulations.

For Ondes, 0.54 litre, flow not fixed.

For Cavaillon 0.55 litre flow not fixed.

For Carpentras 0.71 to 0.85 litre instead of 1.25 litres, as according to the regulations.

Varying thus with the physical nature of the soils. From the above it is evident that there is generally a positive waste of water. In the general interest the use of water should be limited to the quantity that is really useful so as to extend its benefits to the greatest possible surface.

At the station for the study of plant chemistry at Meudon, the quantity of water evaporated for the formation of one part in weight of dry produce was ascertained to be 550 times as great. According to this ratio, in order to obtain the increase of yield given by irrigation, the following quantities of water would be required.

Stations	Increase of yield		Quantities of water			
			Evaporated by the crop		Usually applied	
—	kg	cwt	m^3	cub ft	m^3	cub ft.
Fourcadel . .	2 700	53	1 485	52 420	5 880	207 564
Ondes	3 500	69	1 925	67 952	3 500	123 550
Carpentras . .	10 000	197	5 500	194 150	20 700	730 710

There is thus great waste in the amount of water applied.

If the above calculations be repeated for a crop of aftermath hay during a period of extreme drought the following figures are obtained.

Stations	Increase of yield due to irrigation		Number of waterings	For each watering			
				Volume of water usually given		Volume of water utilized by the plants	
—	kg	cwt		m^3	cub ft	m^3	cub. ft.
Fourcadel . .	2 200	43 29	6	490	17 297	202	7 130
Ondes	2 225	43.83	4	500	17 650	306	10 802
Carpentras . .	4 330	85.30	8	830	29 300	298	10 520

These figures show that the amount of water usually given is considerably in excess of that really required by plants. It is not to be expected that in practical farming the ideal amount can be given, and no more; but all efforts should be made to get as near this as possible.

626 LEGG, W. A. **Irrigation in South Africa.** — *Journal of the Royal Society of Arts*, No. 3090, pp. 327-344. London, February 9, 1912.

Union of S. Africa

The Union of South Africa contains some 473 000 square miles. In the year 1910 there was imported into the country over sea, agricultural produce, including grain, meat, milk, butter and cheese, etc., of the value of over three million pounds sterling. The principal causes of the lack of progress in agriculture and consequently irrigation in the South African Union are the following: the distribution of the white popolation but thinly scattered throughout the country; adverse climatic conditions; difficulties of transport, the trunk lines of the country having been constructed for the exploitation of its mineral wealth; legal difficulties which prevent the development of irrigation by giving rise to much litigation among the landed proprietors. For these reasons the country has retained almost entirely a pastoral character.

The growing of crops without artificial watering can only be attempted in some of the more favoured portions of the country, and is limited to wheat, oats, and barley.

The south western portion of the Cape Colony, and what is known as the conquered territory in the Orange River Colony, are almost the only large areas where wheat growing on the rainfall is carried on.

The Orange River Colony is able to produce wheat on the rainfall along the Caledon River, but the Transvaal grows practically none. Maize (mealies) is produced on the rainfall in the Transvaal, Orange River Colony, and Natal.

As a substitute for irrigation, experiments in dry farming are in progress, undertaken by both State and individual farmers.

The mean annual rainfall of the Cape Colony is about 15 ins., that of the Transvaal about 29 ins., of the Orange River Colony 21 ins., and of Natal about 34 ins. The mean for the whole of the Union is probably about 20 ins. per annum.

The total area irrigated now in Cape Colony is about 500 000 acres and at least two million acres might be irrigated. In the Transvaal about 100 000 acres are now under irrigation; there is plenty of scope for irrigation extension in both the Transvaal and Orange Free State.

The Irrigation Act of 1906 is the statute at present in force. It legislates for intermittent streams, as well as for perennial ones. It takes away the absolute ownership in an intermittent stream from the person on whose land it flows, and prevents him from leading away the water of such stream for use on non riparian lands, except by permit from the Water Court in case of surplus water. It also allows prescriptive rights in the water to a lower owner on to whose land some of the water has flowed for a period of thirty years. The act further makes provision for the diversion of the surplus water of a perennial stream across a water shed. Thus, whilst curtailing to some extent the use of the intermittent stream, the act extends the use of the perennial water. It gives to the government, and to some extent to river and irrigation boards, the power to expropriate land for irrigation purposes on payment of compensation to the owners, allows boards and individuals to claim servitudes or easements on the lands of others, and makes provision for the granting of government loans to boards or individuals for irrigation purposes.

Almost the whole of the cultivated land in the Union, with the exception of a strip along the coast, lies at from 2 000 to 6 500 ft. above sea-level.

In the Cape Colony the aromatic herbage of the veld is of excellent quality, though its quantity, owing to lack of moisture, is often less than desirable. In the Orange River Colony and the Transvaal some of the grasses afford good pasture, while others are more or less injurious.

Among the earliest efforts at irrigation a canal from the Breede River in the Cape Colony may be mentioned.

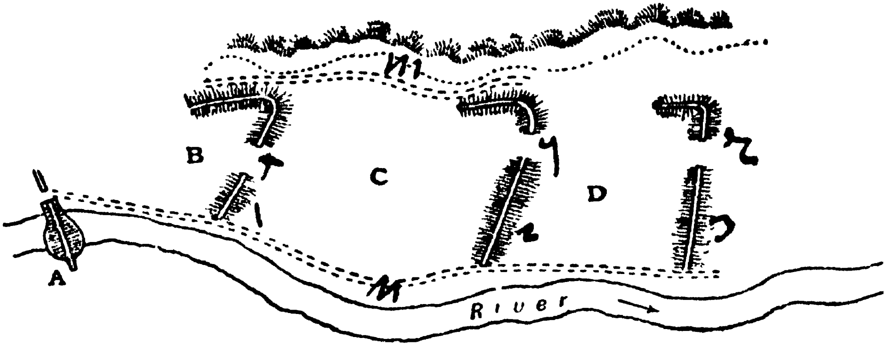
The Oudtshoorn district has been so much improved by irrigation that with the cultivation of lucerne under irrigation, ostrich farming has become very important and is now extending gradually throughout the whole country as may be seen from the following figures :

In	1865	there	were	about	80	tame ostriches in	the country
»	1875	»	»	»	21 750	»	»
»	1891	»	»	»	154 880	»	»
»	1904	»	»	»	357 970	»	»
»	1910	»	»	»	500 000	»	»

In 1908 over £2 000 000 worth of feathers were shipped from Cape ports. In addition to lucerne, tobacco, fruits and vegetables have been cultivated under irrigation.

An interesting method of irrigation is practised in the north-west of Cape Colony, particularly along the valley of the Zak River. It is called " Zaai dam irrigation " and has been compared to the basin method of irrigation in the Nile Valley, on a small scale.

The spreading of the water is aided by the curious circumstance that the land often falls away from the river banks. This condition is brought about by the fact that the river more often floods the land near to its banks than that more remote, and forms deposits of silt which gradually raise the level of the lands adjacent to the river. Irrigation is carried out by throwing a temporary weir across the river in *A* ; the water floods the land in *B* and thence into *C* and *D*, either by means of two canals *m* and *n* or by *x*, *y*, *z*, gaps cut in the low embankments 1, 2 and 3. (See fig. on next page).



Lately the government has aided and encouraged irrigation from boreholes and wells, especially in Bechuanaland and the Transvaal.

The following table gives some idea of the progress of irrigation from 1891 to 1906, that is, up to the passing of the Irrigation Act of 1906.

	Area irrigated in acres	
	In 1891	In 1906
From small dams, wells, boreholes etc.	48 000	50 000
From perennial streams	192 000	230 000
From intermittent streams	69 000	140 000
Total area . . .	309 000	420 000

Since the passing of the Irrigation Act about 100 000 acres have been put under irrigation in the Cape Colony alone.

One of the largest irrigation works in the country now being constructed is the one near Britstown.* It is being built by a syndicate and will include a storage reservoir on the Ongers River, with a capacity of over 3 000 million cubic feet. The dam will be about 60 ft. above the river bed.

The twelve new irrigation districts include some 37 000 acres of land, and several other large schemes are being investigated.

Besides the above, irrigation by pumping is also receiving attention. It is very simple, in some cases, if a pumping plant can be put down adjoining the irrigable land, as by that means the capital outlay may be much reduced and complications with neighbouring proprietors avoided.

During the three years 1907, 1908 and 1909, sixty-three pumping schemes were prepared, which, in the aggregate, cost £41 000 and irrigate some 6 000 acres; about £20 000 of the total cost was loaned by the government. Of these sixty-three installations, fifty were suction gas-power plants, which have generally given much satisfaction. A good many others of a similar nature have been carried out without government aid. About 140 are plants driven by oil engines. Where irrigation by a gravitation scheme is not practicable pumping can render most valuable services.

627 RINGELMANN, MAX. **Irrigation by Sprinkling in Horticulture.** (L'irrigation par aspersion en horticulture) (1). — *Revue Horticole*, 48^{e} Année, Nos 2 et 3, pp. 34-36 et 64-65. Paris, 16 Janvier et 1er Fevrier 1912

France

As rain does not always fall when required by plants, recourse must often be had to artificial watering, of which one of the best forms is *irrigation by sprinkling;* for this purpose, special installations are used, which allow the volume of the drops of water, their velocity and the inclination of their fall to be modified at will.

The Author studied the effect of rain and of artificial sprinkling upon the *settling of the soil* and arrives at interesting practical conclusions. For the same rain (number, velocity and diameter of the water drops) the settling varies with the nature of the soil; some heavy soils settle a good deal and present a hard crust.

The following are some figures as to this superficial caking:

Soil —	Settling of the soil in millimetres —
Very stony	0, or not measurable
Sandy	4.5
Medium	7.5
Chalky	10 —
Clay	15.—
Garden mould	17 to 18

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(1) See *B.*, March 1912, No 486. (*Ed*).

Settled soil has an unfavourable action on the further utilisation of rain or irrigation water, for such a soil loses by evaporation 1 ½ times more water than the same soil when its component parts are loose, as after having being hoed. This evaporation causes besides a loss of heat in the soil. Consequently after a heavy rain or violent watering it is advantageous to hoe the soil between the plants.

When hoeing is not possible because too expensive, the settling of the soil in market gardens may be diminished by covering the ground with a protective mulch which may consist of straw, dry leaves, peat, moss or other vegetable matter. By this means the compression of the surface is very considerably reduced, and much less water is lost by evaporation. The same effect would be obtained if the surface of the ground were covered with coarse materials such as rubble or slag.

Apparatus for automatic watering. — Watering by sprinkling does not require any special arrangement of the ground and it may be used for all kinds of market garden produce, but it entails a heavy cost of labour which can only be borne by very valuable crops.

With view to limiting this expense M. A. Couton (Chateau de Lamothe, Villeneuve-sur-Lot) has devised a system of automatic watering which has been applied in some gardens in the neighbourhood of Paris.

In the garden *A* (fig. 1) a system of pipes consisting of a main *C* and branches *l*, *l'*, *l''*..., has been put down and connected with a reservoir *B* situated at a higher level. The branch pipes which are fitted with nozzles *a* are situated at a distance from each other equal to the width of the beds to be successively watered, by the automatic opening of the cocks *b*, *b'* *b''*... brought about by the mechanisms *m*, *m'* *m''*...

At the commencement of operations the cock *b* is opened, whereupon all the nozzles of the line *l* begin to play; after a certain time, which can be regulated beforehand, the cock *b* is turned off automatically by the mechanism *m*, and, by means of the wire rope *n*, the cock *b'* is opened and waters the next bed through the nozzles on *l'*; then cock *b'* is turned off and by means of the cable *n* and the pulley *k'*, the cock *b''* is opened and waters the next bed, and so on.

The nozzles revolve by the reaction of the water jets, and water the ground as with a fine rain, and very regularly.

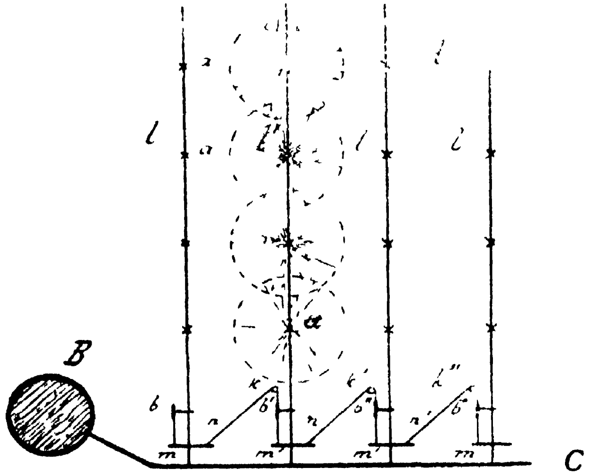

Fig. 1. — Plan of automatic watering

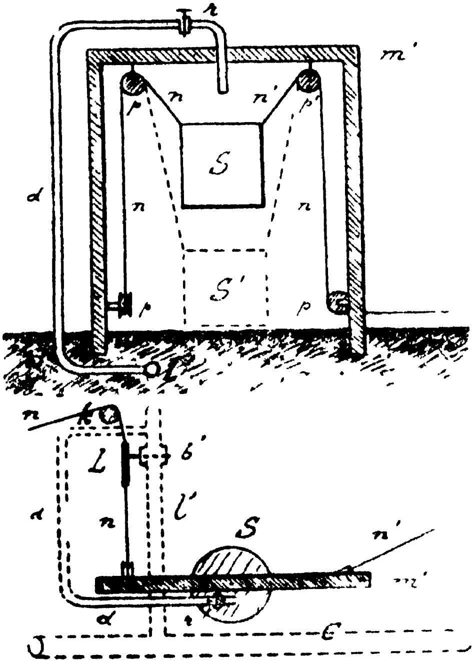

Fig. 2. — Automatic apparatus (plan and elevation)

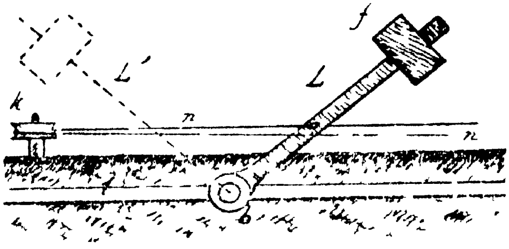

Fig 3 — Automatic cock

Description of the automatic mechanism for opening the cocks b, b' b''...

All the mechanisms *m, m', m''*, (fig. 1) are identical. Each of them consists of a vessel *S* (fig. 2) suspended at a certain height above the ground by the galvanised wire ropes *n* and *n'*; the pipe *d* opening over the vessel is fixed on the pipe *l'* beyond the cock *b'*. The wire ropes *n* and *n'* run on the pulleys *p* and *p'* are respectively connected: *n* with the lever *L* which works the cock *b*, and *n'* with the lever of the next adjoining line.

A support *m'* bears the pulleys *p* and *p'* and the pipe *d*. When the cock *b'* is open, the others being shut, only the nozzles on *l'* act and the bucket *S* gets filled with water issuing from the pipe *d*. The flow being regulated by the tap *r*. When a certain quantity of water is in the bucket its weight causes the latter to descend to *S'*; the wire rope *n* pulls the lever *L'* (fig. 3) into the position *L* and shuts the cock *b'*; the rope *n'* (fig 2) pulls the lever of the next set. Meanwhile the bucket in *S'* is emptied by tipping or otherwise.

The descent of the full bucket of *m'* (fig. 1) caused by the lever *L* and rope *n* (fig. 2) causes the empty bucket of *m* (fig. 1) to ascend. In the same way the ascent of the empty bucket of *m'* is caused by the descent of the next one, and so on. The lever *L* (fig. 3) bears a counterweight *f* to prevent its stopping vertically at a dead centre. The ropes *n, n' n''* work in iron pipes.

From the above it will be seen that in order to water successively the whole surface it is enough to open one cock, the one belonging to the first pipe nearest the reservoir.

The length of time during which the watering is to be carried out on each plot, is regulated by the tap *r* which, by being more or less opened, employs more or less time in filling the bucket.

This system permits of watering being done during the night, which is often advantageous; it allows also, by the removal of one of the wire ropes, of watering only that part of the land comprised between the point at which the water arrives and the length of rope that has been removed.

With a head of 19 to 23 feet of water each nozzle waters a circle having a radius of about 20 feet; thus 56 to 60 nozzles are required per acre. The total cost of such an installation including water pipes amounts to about £64 per acre. which is not much considering the great amount of capital required by market gardening; the labour bill is considerably diminished, because for ordinary hose watering a man, paid about 5*s* a day, is necessary for 1 ¼ acre, whilst the above described installation only requires regulating and starting, and little or no surveillance.

The water pipes may either be deeply embedded in the soil so as not to interfere with the work or they may be merely placed on the ground, in which case they may be easily disconnected and removed when glass frames are to be used.

628 DE ANGELIS D'OSSAT, GIOACCHINO. **Water in Calcareous Soils. The Springs of Caposele, Province of Avellino, Italy.** (Le acque dei calcari. Le sorgenti di Caposele). — *Bollettino della Società geologica italiana.* Vol. XXX, Fasc. 3°, pp. 479-492 + 1 tav. Roma 1912.

Italy

The author has investigated the power of dissolving limestone, possessed by water that has percolated through vegetable soils in general, and through forest soil in particular, and compares this power with that of rainwater. With this object he conducted the following experiments:

In each of three glass vessels he placed 25 grams of pure powdered limestone, and then filled them up with equal quantities of three different kinds of water, namely in one glass rainwater, and in the other two the same rain water, 1 litre of which had percolated in 10 hours through an equal volume of soil, taken in one case from a conifer wood and in the other from an oakwood, in each case from an area of 1 square decimeter (15.5 square inches) (the quantity of water corresponds to the amount which would fall during a short period of abundand rain). After two months and a half these waters were filtered and analyzed; the results were as follows:

Water	Total hydrotimetric degree (French)	Solid residue at 100° in grams per litre	Putting the value for rainwater as 1 the ratios of the other waters become:	
			Hydrotimetric degrees	Residue
Rainwater	12°	0,056	1	1
Conifer wood 3 cm (1.1 inch) of dead leaves etc. 7 cm. (2.7 in.) of vegetable mould; conglomerate subsoil . .	19°5	0,196	1,62	3.33
Oak wood 2 cm. (0.8 in.) dead leaves etc. 8 cm. (3.1 in.) of vegetable mould; conglomerate subsoil	24°	0,290	2	5.17

In another experiment, with the same quantities as in the first experiment, distilled water was filtered through soil taken from a wood composed of common, Turkey and evergreen oaks, situated on a marl subsoil. The water thus obtained was divided into parts which stood to each other as 1 : 2^3 : 3^3 : 4^3. Into each of these, and into a vessel containing distilled water, 25 grams of the same powdered limestone was placed. The total hydrotimetric degree (French) and the solid residue at 100° C. were determined after 31-32 days, and the last sample also after 64 days.

The results of the two experiments agree in showing that rain water or distilled water after having filtered (for 10 hours, height 10 cm.) (4 inches) through a shallow layer (10 cm.) of forest soil, neither acid nor poor in lime, acquires a greater solvent power, which increases with time (up to about one month) becoming 5.17 and 3.56 times greater than that possessed by rain water and distilled water respectively. This increase of solvent power will increase, in like proportion, the energy with which the infiltrating water widens and deepens the subterranean network of water channels, which tends always to sink lower down.

After having filtered through forest soil the water showed the following increase:

	In hydrotimetric degrees	In solid residue at 100°
I Experiment	1-2	1-5.17
II »	1-1.57	1-3.56

Now it has been demonstrated (Fleck, Fedor, Falk, Soyka, von Rigler) that the hardness of water is an index of its impurity. Consequently the most wholesome drinking water is that derived from rain water which has filtered through the least possible depth of vegetable soil and with the greatest rapidity, especially when the underlying rocks are limestone and easily traversed. The water springing from limestone will be all the better if the catchment basin is bare of all vegetation. In the event of reafforesting such a basin, the neighbourhood of its issue ought not to be rewooded, nor should the land a little above the out-crop level be planted with trees, when the spring is of the so-called over-flow type.

It is to this type that the sources of the Sele, which will feed the Apulian aqueduct, belong, (1) and the author considers them in connexion with the principles laid down in this paper.

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(1) See *B*. Aug-Sept-Oct. 1911, No. 2388. (*Ed.*).

The rocks which crop out in the neighbourhood of the springs are cretaceous limestone, regularly soluble and their residuum is but little adapted as a filter for water.

The author is of opinion that an excessive reafforestation of the catchment area would cause: a change in the chemical composition of the water, a diminution in its quantity, and a sinking of the subterranean network of water channels. And this is all the more likely to happen, for the limestone, near the outcrop of the water, is in contact with clay schists containing pyrites ; and an experiment carried out by the author has demonstrated that the presence of schists, especially if containing pyrites, increases the solvent power of water on limestone (rendering it in some cases as much as 5.23 times greater)

629 Egypt **Hydraulic Works and Cotton Production in Egypt.** — See below No 657.

MANURES AND MANURING.

630 Great Britain: Scotland

WRIGHT, R PATRICK **Experiments on Manuring, on Inoculation, and on Applying Lime to Arable Land, in Scotland.**

1. Report on Experiments on the Manuring of Potatoes in 1907 and 1908. — 2. Report on Experiments on the Manuring of Turnips in 1906 and 1907 — 3. Report on an Experiment on the Cultivation of Lucerne in Scotland and on the Effects of Inoculation. — 4. Report on Experiments on the Improvement of poor permanent Pasture by Manuring. — 5. Report on Experiments (a) On the best Method of Applying Lime to arable Land; and (b). On the relat ve Economy of Ground and Slaked Lime). — *West of Scotland Agricultural College, Tenth Report*; *Bull* 51, 52, 53, 54, 55; pp. 107-221 tbl. XIV. Glasgow ,1911.

(The figures in the text marked with an * refer to the above Reports)

Practical experiments on a large scale and with the co-operation of the owners, on a common plan. Soil light, sandy or sandy loam in the central and south western counties of Scotland.

Experiments on the Manuring of Potatoes. — 1*. The Experiments were made on 17 farms in 1907 and on 14 in 1908. Principal results obtained:

1. Good crops of potatoes may be obtained with farmyard manure alone; and the return is equally profitable when the manure is applied in small (10 tons par acre) or in large dressings (20 tons per acre).

2. Larger and more profitable crops can be grown by small dressings of farmyard manure with the addition of a suitable mixture of artificials.

3. The most successful and profitable mixture of artificials employed in the experiments, and applied in addition to 10 tons farmyard manure per acre, consisted of:

3 cwts superphosphate (30 per cent soluble); basic slag, soluble in citric acid, in the same proportion as the superphosphate;

1 ½ cwts sulphate of potash (94 % purity);

1 ½ cwts sulphate of ammonia.

4. In the above mixture 1 ½ cwts sulphate of ammonia gives a larger and more profitable crop than 1 cwt only.

5 The application of half the phosphate included in the mixture in the form of basic slag, instead of the whole in the form of superphosphate, gave a somewhat better return.

6. Neither the 30 % potassium salt nor muriate of potash proved such a suitable or profitable potash manure for the potato crop as sulphate of potash of 94 % purity.

7. Calcium cyanamide when applied per acre in quantity containing the same amount of nitrogen as 1 cwt sulphate of ammonia, showed itself on a number of farms to be quite as effective or even more so, than the latter manure, but on other farms was distinctly inferior. But when applied in a 50 % greater quantity, it produced no further increase in crop, and showed itself to be less effective than sulphate of ammonia applied in equivalent quantity.

8. Nitrate of lime gave results in one year almost equal to those produced by sulphate of ammonia.

9. Calcium cyanamide and nitrate of lime are deserving of further investigation as sources of nitrogen supply for the potato crop.

10. Nitrate of soda gave an increase in the potato crop practically equal to that produced by sulphate of ammonia.

Manuring of Turnips. — 2*. Experiments carried out on 16 farms in 1906, and on 20 in 1907.

The following conclusions may be drawn:

1. That phosphoric acid applied to the turnip crop, half in the form of superphospate and half as basic slag, will produce a crop as large as if the phosphoric acid were applied wholly in the form of superphosphate.

2. That a sufficient quantity of potash in a turnip manure is essential to the production of large crops, and that the omission to supply potash causes a large reduction both in yield and in profits.

3. That 30 % potash manure salt is as effective as kainit for the supply of potash to the turnip crop.

4. That, on the average of the farms, nitrogen also produced an increase of crop, but it proved to be less important and less effective than potash. The effects of the nitrogenous manures varied with the season, and the condition of the soil and the manner of application. Thus the use of nitrate of soda as a top dressing is not wholly supported by the results of these experiments. The effects seem to vary with the season. On the whole the best results have been obtained by the application of nitrate of soda in the drills.

5. Calcium cyanamide proved itself an effective turnip manure ; in 1907 it showed itself as valuable as nitrate of soda or sulphate of ammonia. Applied to soils for which it is adapted it appears capable of giving results on the turnip crop superior to either of these manures (1).

Improvement of poor permanent pasture by manuring. — 4*. Experiments made on two different soils, one a thoroughly drained moss land, the other a light stony loam lying in parts close to the rock. In 1904 artificial manures were applied and the effects produced during the following seven years were determined by the numbers of sheep carried on the plots, and by the increase of live weight made by the sheep, compared with that of the animals on the unmanured plots.

The conclusion to be drawn from these experiments are as follows (2):

1. Both on moss land and on poor stony loams, poor permanent pastures can be greatly improved by applications of suitable quantities of basic slag and kainit, and these artificials may be applied in such quantities as were used in this experiment, *i.e.* about

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(1) See: *B.* March 1912, No. 491. (*Ed.*)

(2) See: *B.* June 1911, No 1729 (*Ed*).

10 cwts basic slag containing 200 lbs phosphoric acid and 8 cwts kainit (containing 100 lb. potash) per acre.

2. On moss land kainit added to the basic slag greatly increase the returns and the profits, and produces a more lasting improvement on the pasture.

3. On the contrary, on the poor stony loam while the effect of the two artificials is somewhat greater, the advantage of adding kainit may not on such soils prove sufficient to defray the cost. The application of basic slag alone gives a profitable return; the improvement lasting a number of years in gradually decreasing amount.

One of the most important effects of the basic slag, and more especially of the basic slag *plus* kainit on pastures is the effective destruction, within two or three years, of mosses (fog) (1).

Some special experiments were also made by the author at the Experiment Station of the West of Scotland Agricultural College.

Introduction of the cultivation of Lucerne and the effects of inoculation. — 3*. The results of the experiments show that, contrary to the general opinion, there is nothing in the climate of the West of Scotland to prevent the successful cultivation of lucerne, and the consequent enriching of the soil with a large quantity of nitrogen, provided suitable methods be followed. It was also proved that the application of a bacterial culture is the most economical means of enabling the lucerne plants to obtain the nitrogen they require.

The best and most economical method of applying lime to arable land. — 5*. Experiments were carried out from 1902 to 1909, through a rotation of eight crops, on a light loamy soil in high condition. The most important results were the following (2):

1. On land deficient in lime, its application will increase the yield of crops, but the amount of increase obtained will depend on the quantity of lime given, the method of applying it, and the kinds of crops grown.

2. Large dressings of not less than 4 tons per acre applied at long intervals of time are much less effective than the same quantity of lime applied more frequently in divided doses, and, according to the experiments conducted by the author, they are not likely to be profitable. The largest increases of crops were obtained from annual applications of 10 cwts burnt lime per acre. Applications of 5 and of 10 cwts per acre, per annum, gave profit-

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(1) See *B.* February 1912, No. 335. (*Ed.*).

(2) See *B.* April, No. 1144. (*Ed.*).

able results, but the larger dressings of 1, 2, and 4 tons per acre proved very unprofitable.

3. As for the different crops, the direct application of lime to the turnip crop produced a large increase in the yield, and the larger the quantity of lime given, up to 4 tons per acre, the greater was the increase. A dressing of 10 cwts per acre proved however, most profitable.

On the hay crop lime applied to previous crops was beneficial, but lime applied on the young seeds tended to diminish the yield of hay, except when given in small quantity.

On all the cereal crops liming exercised a beneficial effect, it increased the yield of grain, but the yield of straw underwent some diminution. The wheat crop benefited most and barley least. The oat crop occupied an intermediate position. On potatoes, on the contrary, the effect of liming was invariably injurious, and caused a diminution of the crop, even when applied in such a small quantity as 5 cwts per acre. Liming is therefore to be avoided for potatoes If applied at all it should be put on the soil as many years before the potato crop is to be grown as the rotation admits.

4. Gas lime applied at the rate of 4 tons per acre to the turnip crop produced a considerably smaller increase than an equal weight of burnt lime, but in the seven succeeding years of the rotation it gave a total increase of more than three times the value of that produced by burnt lime, and on account of its low cost also it gave much more profitable returns than any other lime dressing used in the experiment.

As for the relative economy of ground and slaked limes, the author gives the following table of the costs of the various operations:

	s	*d*
Cost of lime shells at kiln, per ton	12	0
» slaking and covering with earth . .	0	5
» turning heap and slaking remaining lumps	0	5
» riddling through ½ inch riddle. . . .	0	10
Total cost per ton . . .	13	8
Cost of ground lime per ton at kiln	18	—
Balance in favour of slaked, lime per ton . .	4	4

From the above table it will be seen that it is more advantageous to use slaked lime than ground lime. The slaked lime was made by pouring water on the burnt lime, at the rate of 20 gallons per ton; the heap was then covered with a few inches of earth; about 12 hours later it was turned over, the unslaked lumps were slaked, and the lime riddled to free it from stones etc.

By this means the lime is obtained in a very fine dry powder which can be sown without difficulty by a manure sowing machine. The only drawback is that the lime must be applied immediately after the slaking has been completed, and that accordingly large quantities cannot be slaked at the same time. This however is but a slight difficulty.

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DEMOLON, A. and BROUET, G. **On the Penetration of Soluble Fertilizers into the Soil.** (Sur la pénétration des engrais solubles dans les sols). — *Annales de la Science Agronomiqne*, 28 Année, No. 6, pp. 401-418 + dgr. II. Paris, Décembre 1911.

France

One of the most important questions regarding the economy of the practical application of chemical fertilizers is the method in which it should be carried out. In other words, it is not yet known in what quantities, nor with what rapidity fertilizing substances pass into the subsoil, and how their dispersion thence, which results in econom loss, is to be avoided.

In fact, hitherto the question has been studied, especially at Rothamsted, only by means of direct analyses of the soil water, or by Th. Schloesing Sen. by means of displacement of the soil solutions. Diffusion phenomena require further investigation, although Müntz and Gaudechon have already drawn attention to their very slow action.

The writers, in order to render our knowledge complete as regards this last point in question, have conducted three series of experiments.

1. Laboratory experiments with sodium chloride on non-absorptive substance (sand washed in hydro-chloric acid). Diffusion took place very slowly, being clearly due to displacement.
2. Laboratory experiments with sodium chloride on an absorptive substance (loam): The clay hinders diffusion, probably by means of its absorptive property; but with the fineness of its particles, diffusion, which is also promoted by compression, increases.
3. Experiments with soil with nitrate of soda in the open ground.

a) In 1910, in spite of exceptional conditions favourable to washing down of nitrate of soda to the lower strata (sandy soil, great atmospheric precipitations) the transport and the elimination of this substance from the arable soil were rather slow: 246.4 mm.

of rain were not sufficient to remove entirely from the surface layer of 20 cm. the nitrate which had been applied as a top-dressing.

b) In 1911, 3/4 of the amount of the nitrate of soda applied as a top-dressing on April 12 after the winter rains, was recovered thirteen days later from the first 5 cm. of soil, which shows the slowness of its diffusion, even in light soils, in the absence of rain.

Watering acts in two different ways : in a rainy season, when the soil is sufficiently damp, it contributes by infiltration to the penetration of the nitrate into the deeper layers, but it is not at all the same when the soil has been dried by evaporation as the result of a fairly long rainless period; it then contributes to carrying again to the surface a certain quantity of the nitrate by means of an upward movement of the deeply seated water due to evaporation; this explains the formation of saline crusts which are to be observed sometimes as the result of rain following upon a period of drought.

As a result of these experiments, the writers deduce that in heavy soils, in normal years, there is no fear of the removal of the nitrate of soda during the vegetative period, and that its removal in loamy soils is less rapid than is supposed.

Therefore, it may be concluded that in practical agriculture, the method of application of chemical fertilizers must vary according to the nature of the soil and crops. In general, the heavier the soil is, and the longer the root-system of the plants under cultivation, the earlier it should be used.

Further, contrary to received opinion, in the case of loamy soils, the fertilizer should be applied twice, ploughed in during the winter, and later harrowed in before sowing. The fertilizers must be of a sufficiently fine consistency, so every farm should possess apparatus for pulverising the nitrate of soda and the potash salts just before use. A certain number of the complicated commercial fertilizers owe their practical superiority to the fineness of their particles due to the method of preparation. The application of salt fertilizers as top-dressing should be confined to sandy soils, and should be carried out some time before sowing. If the spring is abnormally wet, a second application is always possible, which, in the writer's opinion, is preferable to running the risk of the inconveniences which might arise as the result of a late application followed by a period of drought.

As regards heavy soils, nitrate of soda given late in the vegetative period will only have a very limited usefulness. No doubt want of labourers is often responsible for insufficient manuring, but the principles laid down are of importance to every agriculturist, and if followed, would ensure real progress in the technique of soil fertilization.

Artificial Manures in Hungary. — Communicated by the Delegate of Hungary, Mr. de Miklós de Miklosvár. **682**

Hungary

In Hungary the consumption of artificial manures increases greatly every year, keeping pace with the growing improvement in agriculture. The *National Hungarian Agricultural Association* has, with the consent of the Government, opened a competition for the best works on the special importance of superphosphates in Hungary.

The following are the principal conditions of the competition:

The competitors are to present their works, marked with a motto, to the Committee of the Association, not later than the 1st of July 1912.

The work must consist of at least three sheets of printed matter. The jury appointed to examine the works will be formed by members delegated by the "National Hungarian Agricultural Association"

The two best works will be awarded prizes of 1000 and 500 crowns respectively (£ 41.13*s*. 4*d*. and £ 20 16*s*. 8*d*) offered by the Association for the use of artificial manures. The first prize will be awarded only to a work of absolute merit.

The following questions must be dealt with:

1. The history of the manufacture of superphosphate and its consumption in Hungary.

2. The consumption of superphosphates in the Western countries compared with that in Hungary.

3. The increase of the various crops obtained in Hungary by the use of superphosphates.

4. The increase in the value of land caused by the increase in crops due to the use of superphosphates.

5. The effect of the use of superphosphates on the increase of national wealth, or the benefit to the country due to heavier crops.

6. Whether the use of superphosphates has had any influence — and if so, of what nature — on the development of railways; and whether the use of this artificial has had any effect on other industries.

7. What quantity of superphosphate the Hungarian agriculturist should use, so as to counteract the impoverishment of the

soil in phosphoric acid, that is, to attain, by giving the soil the necessary amount of phosphoric acid, an average increase of crops corresponding to the general higher cost of economic conditions.

8. Summary.

688 HIDOUX, J. **Results of Experiments with Potassic Fertilizers in Brittany**. (Les Engrais Potassiques en Bretagne). — *Journal d'Agriculture Pratique*, 76e Année, t. I, No. 6, pp. 172-173. Paris, 8 Février 1911.

France: Brittany

Although 48 % of the soil of Brittany is derived from schists, the idea that the greater part is formed by the weathering of volcanic rocks has led to the supposition that potassic fertilisers are not needed, though the use of unleached wood ashes has been much favoured.

Recent experiments made at the Station of Agricultural Chemistry at Rennes, show, however, that the supposed high potash content is a fallacy. The writer organised a series of practical experiments in the district of Lorient, adding to the usual phosphatic manures, 8 cwt. kainit, 2 cwt. sulphate of potash, 2 cwt. chloride of potash per acre of potatoes, mangels, peas, clover and cabbages. The manure was ploughed under. The results of these experiments show, that farmers should not dispense with potash manures which give in many cases greatly increased crops Thus on soil derived from crystalline schists, the use of kainit caused an increase in the potato crop of 500 fr. per ha. (nearly £8 per acre). As a rule, the best results were obtained with the chloride, for the crop rose from 105-150 qls. per ha. (54-120 cwt. per acre) without potash, to 190-300 qls. per ha (152-240 cwt. per acre).

The writer advises that large quantities of potash salts should not be used immediately, but that cultural experiments should be made, and potash manures applied to soils well provided with phosphoric acid and lime.

From the above-mentioned experiments, and from those made some years ago, and contrary to the opinions of other investigators, M. Hidoux considers that potash manures have shown themselves to be the most efficacious in the case of soils which are regularly treated with lime and phosphates, so that the phosphatic manures hitherto used must not be replaced by potash manures, as some agriculturist would be led to suppose; but on the contrary, both are necessary, and should be employed together.

The application should be made early, in December, especially when it is put on as a top dressing, as in the case of meadows;

for these kainit mixed with basic slag is recommended. For other crops, the chloride appears the best for soil regularly limed, and otherwise the sulphate. But these conclusions are not final.

FÖRSTER, B. **The Extent and Probable Output of the Potassic Deposits in Upper Alsace.** (Ergebnisse der Untersuchung von Bohrproben aus den seit 1904 im Gange befindlichen, zur Aufsuchung von Steinsalz und Kalisalzen ausgefuhrten Tiefbohrungen im Tertiär des Oberelsass. — *Mitt. Geolog. Landesanstalt Els.-Lothr.*, Bd. VII, H. 4, §§. 349-518 + 1 K.t 4 tf., + 3 Zchn. + 2 Tab. Strassburg i. E., 1911.), *Kali, Zeitschrift für Gewinnung, Verarbeitung und Verwertung der Kalisalze*, VI. J., H. 4, pp. 77-81. Halle a. S, 15. Februar 1912. **684**

Germany: Alsace

The borings made by the Geological Service of Alsace show that the area of the deposition of potassic salts is bounded on the south by Reiningen, on the east by Cernay, on the north by Meienheim, and on the west by the Ensisheim-Mülhausen tramway; the depth diminishes in passing from north to south.

During the work of exploration, 120 borings were made, of which the most carefully examined is that of Wittelsheim I which reached a depth of 1119 m. (3670 ft.), and where potassium was found for the first time in Alsace. From the cores obtained, the sequence of the Tertiary deposits was as follows:

I. Blue marl, from 39 to 100 m. (128 to 328 ft.).

II. Variegated marl, from 100 to 440 m. (328 to 1443 ft.).
  a) Gypsum.
  b) Zone of fresh water.
  c) Dolomitic anhydrous marl.

III. Variegated marls, saline formation properly so called, from 440 to 960.30 m. (1143 to 3149.7 ft.).
  a) Upper bituminous zone, potassic deposit.
  b) Zone of solid rock.
  c) Lower bituminous zone.
  d) Conglomerate.

IV. Green marl, from 960,30 to 1119 m. (3149.7 to 3670 ft.).
  a) Dolomitic marl.
  b) Calcareous marl.

With regard to the potassic deposits, we have first of all the upper stratum of sylvite with a medium actual thickness of 1.164 m. (3.72 ft) which occurring over an area of 84 000 000 sq. m. (100 000 000 sq. yards) represents a total amount of 97 776 000 cub. m. (127 880 000 cub. yds.).

Then follows the lower stratum with a medium actual thickness of 3.507 m. (11.5 ft.) over an area of 172 000 000 sq. m. (205 700 000 sq. yds.), which makes a total amount of 603 204 000 sq. m. (789 000 000 cub. yds.). For the two strata an amount of 700 980 000 cub. m. (916 880 000 cub. yds.) can be reckoned. Taking as a basis of calculation 2.1 metric tons of useful mineral per cub. m. (1.6 Imperial ton per cub. yd.), we have a total of 1 472 058 000 metric tons; at 22 % of potash this leaves in round numbers 300 000 000 tons of pure substance as the whole deposit of sylvite in the Upper Alsatian basin of Wittelsheim.

Now, in 1909, for example, the total consumption of potash was 675 330,9 metric tons worth 144 956 647 fr. (£5 740 857.6*s*.), so that the value of the Wittelsheim potash deposit would be 65 000 000 000 fr. If the world's consumption per anmum remained at the above-mentioned figure, the Wittelsheim deposits would last for 493 years. Judging however from the increased demand for potash in Germany, it may be assumed that the annual consumption will still increase 10 % for 50 years, thus the Upper Alsatian reserve would only last 40 years but we must take into consideration that other supplies exist in North Germany. According to the German laws relating to potash (1), the Upper Alsatian deposits, like all the others in the German Empire, are required to be controlled by the Potash Syndicate and they therefore cannot enter into competition with those of Stassfurt. (2).

685 GOLTE, W. **Potassium Salts a Protection against Frost.** (Schutz durch Kalisalze gegen Frost). *Illustrierte Landwirtschaftliche Zeitung*; 32 Jahrg., Nr. 10, p. 77. Berlin, 3 Februar 1912.

Germany

Some experiments have been carried out by Dr. Golte with the object of showing how far potassium salts protect plants from frost. Of three rye plots, each a quarter of an acre in area, the second received no potassium, while to the first was applied 264 lbs of kainit, and to the third 132 lbs., as top dressings. It was then found that at a temperature of - 11° C. (+ 12° F.) the soil of the first and third plots remained unfrozen, in sharp contrast to that of the second. The moisture on the surface of the soil contained a considerable amount of salts in solution, and therefore did not freeze. The treated plants however did not look so well as those on the second plot. The leaves had the appearance of having had the water withdrawn from them by means of plasmolysis. But when the thaw set in, this pathologic aspect entirely disappeared, and the plants soon looked better than the others, and it is clear that the temporary withdrawal of water from the leaves did no lasting harm.

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(1) *Gesetz über den Absatz von Kalisalzen vom. 25 Mai 1910.* (*Ed.*).

(2) See also *L'Engrais*, 27e A., No. 6, p. 156. Lille, 9 Février 1912. (*Ed.*).

The injurious effect of frost is known to lie in the fact that the water contained in the intercellular spaces and in the cell sap lacerates the tissues in the alternate processes of freezing and melting.

Now as the kainit withdraws a considerable quantity of this water, the change in volume of the remainder takes place without doing serious harm.

AGRICULTURAL BOTANY.

CHEMISTRY AND PHYSIOLOGY OF PLANTS.

686 HUTCHINSON, H. B. and MILLER, N. H. J. (Lawes Agricultural Trust). **The Direct Assimilation of Inorganic and Organic Forms of Nitrogen by Higher Plants.** — *The Journal of Agricultural Science*, Vol. IV, Pt. 3, pp. 282 — 302 + Plate 1 + Tables 4. Cambridge, January 1912.

England

It is now known that any nitrogenous compound applied to the soil will, sooner or later, under ordinary conditions, be converted into nitrates, and if it can be shown that from certain types of nitrogen compounds plants can directly obtain all the nitrogen they require, and that of such types some are more favourable than others, the results cannot fail to throw some light on the synthetical processes in plants.

The conclusions so far reached may be summed up as follows:

According to Molisch, M. Schultz, Perciabosco and Rosso nitrites are assimilated by different plants when in sufficiently dilute solutions; further, plants supplied with nitrogen in potassium nitrite solutions or as ammonium salts, contain a distinctly higher percentage of nitrogen than plants grown with nitrate. Other inorganic compounds of nitrogen — amidosulphonic acid, hydroxylamine, hydrazine sulphate, and azoimide — have given negative results.

As regards organic compounds the majority have given negative, or at most uncertain results (1).

In the investigations described in this paper, as in the previous ones, the seeds were sterilised by a mercuric chloride solution under reduced pressure, and the plants (peas) were grown in Woulffe's bottles with the usual mineral substances in about 1 litre of water. The nitrogenous compound was added in such quantity as to supply about 80 mg. of nitrogen. The garden soil experiment gave no positive results.

It was found that the soil in the bottles had become infected and contained considerable amounts of ammonia.

The various compounds may be divided into the following groups, according to their availability, or otherwise, as direct sources of nitrogen for peas:

I. *Readily assimilated :* Ammonium salts ; Formamide ; Acetamide ; Urea. Barbituric acid ; Alloxan ; Humus.

II. *Assimilated :* Glycine ; α - Aminopropionic acid ; Guanidine hydrochloride ; Cyanuric acid ; Oxamide ; Peptone.

III. *Doubtful or not assimilated :* Hippuric acid ; Trimethylamine ; *para* - Urazine ; Hexamethylenetetramine ; Ethyl nitrate ; Propionitrile ; Hydroxylamine hydrochloride ; Methyl carbonate.

IV. *Toxic :* Tetranitromethane.

The results so far obtained are not sufficiently numerous to make it possible to trace any connection between the assimilability or the reverse of the nitrogenous compounds and their constitution. Apart from humus, which, as a mixture, cannot be said to have a constitution, the best results were obtained with urea and barbituric acid, the former assimilating rather more nitrogen than the latter, whilst barbituric acid gave the greater amount of dry produce.

The similarity of the two results is probably due to the fact that barbituric acid is readily decomposed with production of urea and malonic acid.

The next best result was obtained with acetamide, which gave nearly as much dry produce as barbituric acid, although less nitrogen was assimilated. After acetamide the highest results as regards the amounts of nitrogen assimilated were those obtained with ammonium sulphate (without calcium carbonate), formamide, and alloxan, which assimilated 12.5, 8.5, and 7 mg. of nitrogen respectively. Glycine, alanine, and peptone come next with 5.8, 5.1 and 4.8 mg. of nitrogen. Then oxamide (3.6) and guanidine (2.7 mg. nitrogen), and lastly cyanuric acid.

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(1) Cf. *B.* March 1912, No. 494. (*Ed.*).

The assimilation of nitrogen varied from a maximum of 33.7 (culture infected) for urea to a minimum of 1.3 for cyanuric acid + $CaCO_3$. With humates the nitrogen assimilated amounted to only 5.9 mg.; the amount of dry produce was however comparatively high, being more than was obtained with urea.

The above grouping is only provisional, and it should be remembered that the ability of a plant to utilise the nitrogen of any particular compound depends not only on its power of detaching the nitrogen, but on the nature of the carbon compound or compounds remaining. A copious bibliography is annexed.

MOLLIARD, MARIN. **Is Humus a Direct Source of Carbon for the Higher Green Plants?** (L'humus est-il une source directe de carbone pour les plantes vertes supérieures?). — *Comptes Rendus de l'Académie des Sciences.* Tome 154. No. 5; pp. 291-294. Paris, 29 Janvier 1912. **687**

France

After it was established that certain organic substances relatively simple, such as sugar, are absorbed by the higher plants, and form food-stuffs for them, the question was asked whether the same was not true for more complex substances and particularly for humus. Besides its theoretical interest, this question is of great practical importance,

The action of humus on plants through the nitrogenous and mineral substances contained in it has been proved in numerous works, but the carbon food of the plant as taken from the soil's humic matter *has not yet been demonstrated.*

In a first series of experiments with plants grown in sterilised earth, and protected from the carbonic acid in the air, the writer has shown the effect which humus may produce on plants by reason of its production of carbon dioxide. But the conclusion already reached is that, if humic substances are directly assimilated by green plants, yet the amount so absorbed is altogether insignificant.

BAGULEY, ALLAN. **The Phosphate Nutrition of Plantes.** *Journal of Agricultural Science*, Vol. IV, Pt. 3, pp. 313-322 + fig. 1. Cambridge, January 1912. **688**

Great Britain
England

Much work has been done in America, on the Continent and in England, to determine the effect of different finely-ground, naturally-occurring phosphatic substances on plants growing under different conditions. In a few cases results or conclusions appear to conflict.

Not nearly so much attention has been devoted to the effect of artificially prepared insoluble salts of phosphoric acid on the growth of plants, when these are employed in the absence of ammonium salts, and acid soil substances. Definite information should be obtained as to the powers possessed by plants of utilizing insoluble phosphates.

For this purpose, the writer made some pot cultures of peas, oats and swede turnips. The medium in which the plants were grown was chiefly made up of pure white sand; to this were added the different phosphates, and a nutrient solution. The phosphates used were ferric phosphate, aluminium phosphate, and calcium phosphate. Grown with calcium posphate, oats germinated and died; peas developed badly with few flowers and puny pods ripening early; the swedes commenced to grow about six weeks late, but developed normally.

Grown with ferric phosphate, oats made strong very well developed plants with dark foliage, and plenty of seed ripening late; peas made sturdy healthy plants with well-developed pods, not very numerous, ripening late; swedes grew steadily and well from the start. The results obtained with aluminium phosphate were much the same.

Compared with the superphosphate plants, the oats did not tiller so well as these latter, but they were in each case clearly stronger in the straw and longer in the ear, being finer plants altogether; the swedes were both larger and more healthy than with the superphosphate; the peas grown with ferric phosphate and with aluminium phosphate were neither so early nor so fruitful as when grown with superphosphate.

With calcium phosphate, the results were very different: the oat plants were very ill-developed and produced no ear at all; the swedes started badly, but at the end of the season, though late, were healthy plants; the peas grew moderatily well, but the plants ripened early and the crop was poor.

Subsequent experiments were carried out with the object of ascertaining the effect of ignition and extraction with boiling water on the availability of the precipitated phosphates. The results showed that:

1. Ignition and extraction with boiling water excercise a considerable effect on the availability of the phosphate.

2. That insoluble calcium phosphate is markedly less effective in the growth of oats than insoluble iron phosphate.

3. That this difference in efficiency is not apparent in the case of swedes and peas.

The results as a whole are in accord with the conclusions of Söderbaum (1) and Prianischnikoff, the former found that not much phosphoric acid is available for the oat plant, and the latter, that even in pure sand, lupins can use apatite, though Gramineae fail to do so.

Recent Chemical and Physiological Investigations on the Sugar Beet. 689

(The figures in brackets refer to the bibliography at the end of the article).

Austria

The formation of sugar in beets is a question in the chemistry and physiology of plants, of the greatest practical interest, from the study of which further improvements in the cultivation of beets are to be expected. On this subject several recent works have appeared.

First of all Stift (1) as a result of some researches on the root rot of beets, of which he again states the origin and nature to be highly complex, confirms the opinions of Strohner, Briem and Fallada (2) as to the injurious action of shade on the root development of beets.

It thus seems an established fact that insufficient light causes a development of the leaves at the expense of that of the roots, with the further disadvantage of a lesser accumulation of sugar and of the production, from an industrial point of view, of an inferior crop.

Germany

Passing now to the internal phenomenon of the circulation of sugar in the beet plant; the results obtained by Ruhland in a series of investigations carried out in 1909-1911 at the Imperial Biological Institute for Agriculture and Forestry et Dahlem (3) acquire special importance.

Circulation of sugar

1. Sugar does not circulate as saccharose, as is generally believed, but as inverted sugar, probably as fructose, under this form reaching the root where it is condensed as saccharose.

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(1) See: SODERBAUM, H. O. *Meddelanden från Kungl. Landtbruks Akademiens Experimental fält*, 67, 1-15, — PRIANISCHNIKOFF, *D. Landw. Versuchs. Stat.*, LXIV, 23 et seq.; also this *Bulletin* June 1911, No. 1672. (*Ed.*).

2. In passing through the stem besides the inverted sugar, saccharose also occurs, but only the first reaches the root.

3. In the second period of vegetation sugar circulates in the root as saccharose and is split only on reaching the leaves.

4. Very probably in the floral shoots the ascending sap contains saccharose which is inverted only in the flower buds.

Permeability.

5. The cells of the leaves and stalks are permeable to raffinose, saccharose, maltose and in a greater or lesser degree to other sugars capable of forming starch, as well as to rhamnose and to glycerine, but not to other carbohydrates however diffusible they may be.

6. The permeability to saccharose and to inverted sugar, however, does not seem to be great. Glucose and fructose are diffused somewhat more easily.

7. While light has no sensible influence, the elimination of the products of assimilation appears constantly to modify the permeability.

8. The cells of the root have a lower degree of permeability to the above mentioned sugars than those of the leaves.

9. In opposition to older data, it appears now that exosmosis from the adult roots takes place especially for saccharose.

10. The cribrose ducts are not permeable to sugar like the other cells and therefore can have no part in the circulation of sugar.

Invertase.

11. Invertase in the beetroot is insoluble, and it is found constantly in every part of the plant, with the exception of the seeds and mature roots ,

12. In the young roots of seedlings invertase is present, but with the progress of growth it rapidly disappears, confining itself to the youngest parts, whilst neither in the mature root, nor even in its second period of vegetation, is any more invertase formed.

13. Invertase however may be formed in those roots which appear in consequence of traumatic stimulus.

14. Invertase is not localised separately from saccharose.

15. Probably saccharose is inverted only after having penetrated into cellular plasm, no secretion of enzyme having been observed.

United Kingdom

On the action of enzymes and the circulation of sugar in beetroots in general, some very singular observations have been recently made by Campbell (4) on the leaves produced on two plots of mangolds, one of which had been treated with a complete manure, and the other without potash. From these observations it appears that the want of potash prevents the action of enzymes, and consequently the migration of the hydrocarbons produced by assimilation.

Austria

A further contribution to our knowledge on the circulation of sugar in the beetroot as proposed by Ruhland, is given by a new series of researches made by Strohmer, Briem and Fallada (5), according to whom for the first time it is settled beyond any question that biennal seed-bearing beets can produce sugar in their assimilatory organs. This sugar can accumulate not only in the stems, but also in the roots and eventually in the new formations of the latter.

The same authors confirm the fact, that saccharose is formed as such in the leaves; but, agreeing in this with Stephani (6), they believe, contrary to Ruhland and Gutzeit (7), that sugar is also conveyed under the form of saccharose. Anyhow the literature on the subject deserves notice.

Bohemia

In the selection of beets rich in sugar, some physiological correlations aquire a high value as guides. Thus for instance the connection between the weight of the roots and their sugar content.

From this point of view some recent investigations of Andrlík, Bartos and Urban (8) are important. According to them it appears that:

1. The weight of the root in beets is a character subject to a fluctuating variability, that is, to Quételet-Galton's so called law of accidental causes.
2. The variability in the weight of the roots is considerably greater than that in the sugar content.
3. The variability in the weight of the roots is not the same for every group of descendants, and distinction must be made between a normal and an abnormal accumulation of nutritive substances.
4. For every individual of a given descendance a certain sugar content corresponds, within the limits of variability, to the weight, and viceversa; nevertheless to equal weights the same sugar content does not correspond, and viceversa.
5. Thus no general law of correlation exists, according to which the sugar content diminishes with the increase in weight of the roots; only in extreme cases, and not always, may such a law be

(7) Gutzeit, E. Monströse Runkelrüben und Wanderung resp. Speicherung des Rohrzuckers. *Naturwissenschaftliche Zeitschrift für Forst-und Landwirtschaft*, 9. J., 11. H., pp. 481-507 + fgg. 3. Stuttgart, November, 1911.

(8) Andrlik, K.; Bartos, V.; Urban, J. Uber die Variabilität des Gewichtes und des Zuckergehaltes der Zuckerrübenwurzeln und über die gegenseitigen Beziehungen dieser beiden Merkmale. *Zeitschrift für Zuckerindustrie in Böhmen*, J. XXXVI., H. 4, pp. 193-210 + fgg. 4. Prag. Jänner 1912.

(9) Novotny, K. Ein Beitrag zu Betrachtungen über die Beziehungen zwischen dem percentuellen Zuckergehalte und dem Gewichte der Rüben. *Ibid.*, pp. 269-272. Febr., 1912.

640 **United Kingdom: England**

Composition of Hay: Influence of Time of Cuting. — See below No. 653.

641

Kövessi, François. **Effect of Continuous Electrical Currents on the Development of Plants.** (Influence de l'électricité à courant continu sur le développement des plantes). — *Comptes Rendus de l'Acad. des Sc.* T. 154, No. 5, pp. 289-291. Paris, 29 Janvier 1912.

France

Since 1907 the author has been carrying out investigations, in the open, on the influence of electricity on the germination of seeds and on the successive development of herbaceous and woody, agricultural and forest plants.

The greater part of his work has been devoted to wheat (*Triticum sativum*) the speedy germination and development of this plant rendering it very suitable for methodical and precise research on the above mentioned phenomena. The results obtained have been verified by the Author and generalized by experiments made with other plants, both herbaceous and woody, such as: *Secale cereale, Avena sativa, Hordeum distichum, Vicia sativa, V. Faba, Stellaria media*, various meadow grasses, *Abies alba, Picea excelsa, Pinus sylvestris, P. nigra, Larix europaea, Robinia Pseudacacia, Betula verrucosa, Tilia parvifolia, Fraxinus excelsior, Quercus pedunculata;* and on some cryptogams, such as mosses, several species of algae and of fungi.

The action of continuous currents of electricity is, according to the author, decidedly injurious to the germination of seeds and to the development of plants.

Electricity, even in the corresponding points of experiments carried out in the same way, acts differently under varying conditions.

Denoting the presence of the two determinants of length by L_1 and L_2, and their absence by l_1 and l_2 respectively and allowing that the Tannenkrüger are homozygotes as regards L_1, and the Mammoths as regards the same character, we have Tannenkrüger = $L_1 L_1 l_2 l_2$ and Mammoth = $L_1 l_1 L_2 l_2$.

In the first case the male and female gametes are always $L_1 l_2$, while in the second case, two different types occur, *viz.* $L_1 L_2$ and $l_1 L_2$. On reuniting $L_1 l_2$ with $l_1 L_2$, we obtain offspring which possesses two pairs of characters, which should group themselves in F_1 in such a manner as to divide in the second generation into elongated and shortened forms in the proportion of 15 : 1.

In crossing two elongated types, it is possible also to obtain in F_1 round beets even where one of the parents is a heterozygote as far as the character ' length " is concerned. On the other hand, from the cross of two elongated types there may occur in F_2 "new" long types.

Thus Golden Tankard × Barres gives rise in F_1 to long forms and in F_2, in addition to these, to some forms which are nearly round and to others oval in shape. The presence of nearly round and of oval forms is explained by the presence of two different determinants for the character " length ".

That is to say, if the length of one beet is caused by L_1 and the other by L_2, in F_1, some of the offspring have both pairs of factors; in some, one factor is missing, (these are the long roots); while in others, none of the " length " factors are present; these are the round roots.

Thus from all that has been said, it is clear that beets have, at least, four different form determinants, two of which affect the shape of the base and two the length. These determinants are independent of one another, and can exist alone, or in combination.

The question of colour-inheritance among mangels is, however, far more complicated and seems to depend on a large number of factors of which some on union give rise to a certain colour, some mask this colour, while others intensify an existing shade. The F_1 roots are red, not only when their parents are red, but also when the latter are respectively red and pink, red and yellow, red and white, pink and white and also both white.

Further, the offspring of isolated red beets can be:

Red, pink, yellow and white.
Red, pink and yellow.
Red, pink and white.
Red, yellow and white.
Red and pink.

Red and yellow.

Red and white.

Yellow Globe × Barres (Yellow types) gives in F_1, all yellow hybrids; in F_2, most of the offspring are yellow, but there are a few red, the ratio, counting by groups, being 15 : 1.

Thus in the above cross, which included 75 beets, there were 69 yellow and 6 red, which corresponds with the figures theoretically expected, 70 and 5.

How is this segregation of characters to be explained. From the ratio 15 : 1, as has already been mentioned, we see that we have to do with two different factors G_1 and G_2; their absence may be represented by g_1 and g_2.

Schematically the matter can be expressed as follows:

$$\begin{array}{ccccccc} G_1\ G_2 & & G_1\ g_2 & & g_1\ G_2 & & g_1\ g_2 \\ 9 & : & 3 & : & 3 & : & 1 \end{array}$$

1/16 of the offspring were red.

Thus there are in this case two factors which alone, or combined give the same result—yellow.

Turnips. — In turnips also there are two " length " factors. On crossing Bortfelder (an oval form) with Centenary (which is nearly round) the F_1 hybrids are oval and the succeeding generations contain oval and nearly round roots in the proportion 15 : 1.

Representing the " length " factors by L_1 and L_2 and their absence by l_1 and l_2. a pure Bortfelder has the composition ($L_1\ L_1\ L_2\ L_2$) and a pure Centenary ($l_1\ l_1\ l_2\ l_2$). The gametes of the former have a constitution of $L_1\ L_2$ and those of the latter, $l_1\ l_2$.

In F_1, the hybrids have the composition $L_1\ l_1\ L_2\ l_2$, from which four types of gametes can be derived:

$L_1\ L_2$ (2 " length " factors)
$L_1\ l_2$ (1 length factor)
$l_1\ L_2$ (» » »)
$l_1\ l_2$ (no » »)

These four gametes can combine in 16 ways, one of these is ($L_1\ L_1\ L_2\ L_2$), another is ($l_1\ l_1\ l_2\ l_2$); all the other combinations contain L and l. Thus only 1/16 of the offspring are nearly round, repeating the ratio 15 : 1 already present in the analogous preceding cases.

With regard to colour, two portions must be distinguished, the top, which is purple, green, or yellow, and the base, which is yellow or white. In the upper part, according to the writer, green is dominant to yellow and in the lower portion, white is dominant to yellow. When Bortfelder, yellow-top, is crossed with Centenary green-top, in F_1 the proportion of green to yellow tops is 3 : 1. In one case, of 403 turnips in the second generation, 308 were green and 95 yellow; theoretically there should have been 302 and 101; the approximation is therefore quite satisfactory.

White Tankard Purple-top, with purple top and white flesh and base, crossed with Bortfelder, with yellow top and flesh, gives in F_1 exclusively turnips with purple tops and white flesh. On the other hand, in F_2-n there are four different types as regards " colour " character. Out of 412 turnips of F_2, there were: 229 with purple tops and white flesh; 98 with yellow tops and white flesh, 68 with purple tops and yellow flesh, and 17 with yellow tops and flesh. According to theory, segregation takes place into two independant characters; the groups in question would contain theoretically 232, 77, 77 and 26 turnips.

Kohl-rabi. — In kohl-rabi the writer only considers the colour of the top, which may be : dark reddish-purple, light reddish-purple, and green. When it is the first, the neck is of the same colour, but when the top is red-green the neck is usually green.

In this case, there are two different factors for red, one of which gives a dark shade, and the other a lighter; if both are wanting, the top is green.

" Gelbe Schwedische " (with green top), crossed with "Magnum Bonum " (reddish-purple) gives in F_1 only reddish-purple hybrids. The F_2 contains three types: thus out of 4308 specimens, 3472 were reddish-purple, 728 red-green and 108 green, which makes the proportion 12 : 3 : 1. This ratio shows the presence of two determinants for red; a dark red factor and a light-red, of which the first is dominant to the second.

Thus those kohl-rabi having the two factors (9/16) are indistinguishable from those (3/16) which have only the dark red factor: therefore in a group of 16 kohl-rabi, 12 will be of a similar red.

In conclusion, it seems that the cultivated varieties of mangels and turnips are excellent material for the study and application of Mendel's laws.

644 BLARINGHEM, L. **The Present Position of the Mutation Theory.** (L'état present de la théorie de la mutation). — *Bulletin de la Société botanique de France*, T. LVIII, 1911, pp. 644-652. Paris, Février 1912.

France

One may define a mutation in a pure and homogeneous strain as the sudden appearance of one or more individuals or buds possessing new characters capable of passing on unchanged by means of sexual reproduction. According to De Vries, mutations are quite distinct from fluctuations, which are habitual variations of the characters of a species about a mean. Fluctuations affect characters already possessed by the species, while mutations involve loss or acquisition of characters. Mutations are thus hereditary alterations of a definite nature, whose existence can be recognized by growing pure strains.

Johannsen (1) has been able to observe four definite mutations during ten years' cultivation of French beans Two of these were bud variations (bud white and completely devoid of chlorophyll, and bud with yellowish leaves); the other two affected the shape (elongated) of the seed.

Since 1895 De Vries has been studying *Oenothera Lamarckiana*, which has given 3 % of mutants belonging to about ten different types, mostly stable.

Zeijlistra (2) has found that the stunted shoots of *Oenothera nanella* (one of the mutants of *O. Lamarckiana*) contain cells full of the zooglaea of *Micrococcus*; but as the disease (if so it may be called) is completely hereditary, this explanation does not affect De Vries' conclusions.

D. F. Mac Dougal (3) has studied the modifications produced in pure lines of *Oenothera biennis* and *Raimannia odorata* by the injection of solutions into the young ovary within twenty-four hours of fertilization; he used 10 % sugar, 1 % zinc sulphate, and 1 % calcium nitrate. Since 1906, pure lines of *Eschscholtzia*, *Argemone*, *Physalis*, *Anemone*, *Pentstemon*, *Nicotiana*, and *Echinocerus* and numerous other cacti have been treated in the same way. The results of all these seem to show that hereditary changes can be provoked by artificial means.

Similar experiments were carried out by Klebs who produced modification in the descendants in the case of *Sempervivum*. L. Blaringhem has produced most of the same modifications by the direct action of mutilations; he has also studied the action of traumatism in this connection (4).

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(1) "Ueber Knospenmutationen bei *Phaseolus*": *Zeitschrift für ind. Abstammungs- und Vererbungslehre*, I, 1910, pp. 1-10; and communication to the 4th. International Conference of Genetics, Sept. 19, 1911.

(2) "*Oenothera nanella* de Vries, eine krankhafte Pflanzenart": *Biolog. Centralbl.*, T. XXXI, 1911, pp. 129-138.

(3) "Alterations in Heredity induced by Ovarial Treatments": *Botanical Gazette*, Vol. LI, 1911, pp. 241-257.

(4) *Mutations et traumatismes*, 1907, pp. 131-133; *Modifications brusques*, 1911, pp. 297-318.

According to L. Blaringhem, animal and vegetable parasites may also produce similar modifications and give rise to mutations.

R. R. Gates in America, J. M. Geerts in Holland, and B. M. Davis in England, have ascertained that the nuclei of the sexual cells in *Oenothera Lamarckiana* contain 7 chromosomes, while in *O. gigas*, one of De Vries' mutants, the number is 14. Since 7 is the usual number in *Oenothera*, *O. gigas* may be said to have the same relation to the other species as *Paris* (12 chromosomes) to *Trillium* (6), and *Nymphaea alba* (32) to *Nuphar luteum* (16).

It has recently been suggested (1) that some mutations may have a connection with the probable apogamy of certain mutants, but the facts on which this hypothesis is based require further study.

" To sum up ", says M. Blaringhem, " the theory of mutation remains intact as regards experimental data, and is further supported by new discoveries ".

645 Italy

Systematic Selection of Seed Wheat and of Clover Seed at the Vegni Agricultural Institute, Prov. of Arezzo, Italy. See below No. 705.

646

JONES, T. **Selection of Seed Maize.** — *The Queensland Agricultural Journal*, Vol. XXVIII, Pt. 1, p. 20, Brisbane, January 1912.

Australia: Queensland

Maize seed should be selected while on the stalks in the field, because it is then that the size and length of shanks, the height of the cob on the stalk, and the general health of the plant, can be observed.

It is not always wise to select the largest cob for seed, because very large cobs mostly owe their size to exceptional conditions during growth, and are therefore not likely to transmit it. Neither should cobs be chosen that stand too upright on the stalks, because such cobs readily take in rain, which causes shoots to grow out from the ends of the cobs.

The best cobs are those which are not too high on the stalks and the shanks should be slightly bent.

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(1) R. R. GATES, " Apogamy in *Oenothera* ": *Science*, N. S. 1909, Vol. XXX. pp. 691-694. MRS. R. H. THOMAS, " Various Crossing Experiments ": Communication to the Congress of Genetics at Paris, Sept. 20, 1911.

It is essential that the stalks should be strong and healthy at the early stage of growth, in order to support the cobs; otherwise the crop may be knocked down by rain and wind. Also the husks should extend well over the points of the cobs, which are thus protected from the cotton boll worm and from storms.

The time to select the seed is when some of the cobs are ripe, some ripening, and some green. At such stages it is easy to determine the early, medium, and late maturing varieties.

Great care should be taken in the thrashing of the seed; to prevent any possible cracking of the grain hand thrashing is desirable. The ends of the cobs should be discarded, the grains being smaller. The seeds must be selected from the centre of the cobs in order to ensure their being of uniform strength. Uniform strength in seed means a uniform crop.

COLLINS, G. N. and KEMPTON, J. H. **An Improved Method of Artificial Pollination in Corn.** — *U. S Dept. of Agriculture, Bureau of Plant Industry. Circular* No. 89, pp. 3-7. 647

United States

All the methods hitherto adopted for making self-pollinations in corn have the drawback of leaving the silks exposed for a short time to any pollen that may be floating in the air.

The new method here proposed eliminates this danger and is especially useful both in practical selection and in scientific research connected with problems in heredity. It has the further advantage of being inexpensive and easy to apply. It involves the use of strong paper tubes about 4 inches in diameter and 40 inches long. To apply the tubes, one end is pushed over the tassel which is carefully bent downwards and wired firmly at a point just below the upper end of the last leaf sheath. The other end of the tube is then brought down and passed over the young ear and securely wired. In order to provide for the increasing size of the ear a coiled wire is used, instead of a straight wire, to fasten the tube to the ear. The tubes should be put in place four or five days before the silks are expected to appear.

While this method can be generally applied to ears that are to be self-pollinated, it works equally well for artificially crossing two plants that are adjacent in the same or neighbouring rows. In testing Mendelian ratios it will be found convenient to arrange the planting with the hybrids between the parents. It will thus be possible to apply the method to self-pollinations and crosses between the hybrid and the parents.

648 LEAKE, H. M. and PRASAD, RAM. **Notes on the Incidence and Effect of Sterility and of Cross-Fertilisation in the Indian Cottons.** — *Memoirs of the Department of Agriculture in India: Botanical Series*, Vol. IV, No. 3, pp. 37-72. Calcutta, January 1912.

British India

The methods which can be adopted to procure improvement in a particular crop have been classified by Cook (1), and in the choice of method the experimentor should be largely guided by two considerations: 1) the extent to which cross-fertilisation takes place under normal field conditions; and 2) the degree of sterility which may result in plants subjected to artificial self-fertilisation carried out through a series of generations.

The work of improvement falls into two sections: 1) the production of an improved type, or types in a state of purity; 2) the multiplication of these types when established, until a stage is reached when distribution may be attempted. On the extent to which natural cross-fertilisation is found to occur, will depend the precautionary measures to be adopted in order to prevent a gradual deterioration of the crop.

The series of experiments made at the Agricultural Research Institute, Pusa, with the object of producing an improved cotton suited to the conditions of the United Provinces, has led to the two following general conclusions.

1. A considerable degree of sterility results from self-fertilisation repeated through a number of successive generations.
2. Cross-fertilisation takes place to a considerable extent, though the greater portion of this is limited to neighbouring plants.

The practical bearing of these considerations is of some importance. In the early stages of experimental work, when individual plants are under examination, it is necessary to guard against the effects of cross-fertilisation by protecting the flowers. By so doing, however, the danger is incurred of the loss of vigour, and even of the loss of the race through sterility It is advisable therefore to rely for purity on careful selection, combined with roguing, among such plants as are least likely to have been crossed. For this purpose the types should be grown in numbers sufficient to give a fair body of individuals separated by at least 10 ft. and by intervening plants from individuals of a different type.

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(1) See U. S. Dept. of Agr., Bur. of Plant Industry, *Bull.* 146.

A further method — the efficiency of which still remains to be proved — consists in enclosing by a single net a set of 40-50 plants of one type.

It is well known that the cotton crops in India as well as in China, Persia, and America are as a rule not pure, but consist of a number of forms and in certain cases, of different types. Such a mixed crop will, under certain constant conditions, maintain a definite proportion betveen the various constituents. On the other hand new conditions will favour one or other of the component types, which will, in a short time, become the dominant element of the crop.

In this connection we should remember the frequent instances of the conversion of red to white wheat and of bearded to beardless, as the result of " degeneration " consequent on change of environment. Now if such cases are possible with wheats, in which cross-fertilisation is of the rarest occurrence, the danger of this " degeneration " in cotton, in which cross-fertilisation must also be considered, is much greater.

From very early times repeated efforts have been made to acclimatise various exotic cottons in India, but with little success. The crop at first maintains its standard, and subsequently undergoes a more or less rapid degeneration. The similarity between this and the cases of " degeneration " in wheat in striking, and suggests the possibility of a like cause. A less desirable type, which has not been completely eliminated, may acquire under new conditions of climate, a less careful cultivation, and cessation of roguing, a preponderance over the other forms.

In America excellent varieties have been obtained by means of a careful system of selection; but in order to keep them the indispensable conditions are a continuous and judicious roguing and the highly developed processes of cultivation belonging to the American cotton field.

The process of acclimatization has consequently been marked in most cases by a deterioration which has often been attributed to a degeneratian of the race, but it is more probably simply the self-assertion of those impurities which are best siuted to the new environment. The problem of the introduction of exotic races consequently assumes a new aspect. The larger the original importation of seed, the less would appear to be the chance of successful introduction, owing to the greater difficulty in the control of this process of displacement of one form by another. Before introducing an exotic variety it should be subjected to a most careful control, and a comparatively small importation is all that is at first necessary. The aim should be to eliminate the less desirable forms, which under Indian conditions might become dominating, and form a new equilibrium suited to the new surroundings.

In all experiments made for obtaining the "improved type", the dangers of sterility and of cross-fertilisation should never be lost sight of.

649 PFENNINGER J. **How New and Valuable Varieties of Fruit may Arise**. (Wie neue wertvolle Obstsorten entstehen können). — *Der Schweizerische Obstbauer*, XIV Jahrg., Nr. 2, pp. 33-35. Münsingen, Februar, 1912.

Switzerland

It seldom happens that fruit trees, when ungrafted, yield fruit such as to be worth reproducing. But an interesting exception is recorded by Mr. Pfenninger. A wild apple tree, about 20 years old, without any previous pruning or grafting, suddenly began to yield very fine apples of excellent quality. This « variety » was then grafted on other wild apple trees, and soon began to be known for its beauty of appearance and choice quality under the name of the « Stäfner Rosenapfel ».

Apart from the purely scientific interest attaching to it as illustrating the « Spontaneous variations » of Darwin, or the « Minor mutations » of De Vries, this case is a remarkable instance of how out of a wild apple tree a new variety, now much valued in commerce, was evolved.

650 KOBRANOFF, H. P. **On the Production of Seed for Forest Trees.** (Is Oblasti Liesnogo Siemenoviedieniia). — *Liesnoi Xurnal* (Forest Review), G. XLI, Vep. 9-10, pp. 1373-1403. S. Peterburg, 1911.

Russia

It is well known that the germinating power of the seeds of forest trees may vary, under ordinary conditions, within very wide limits, for different lots of seed taken from a single species, and even from the same tree.

This was hitherto supposed to depend on errors in experiments and on the difference in the methods employed. But the recent researches of Baur have shown that this view is entirely mistaken, as will be seen from the following table:

Method adopted in the experiments	Germination began after:	Germination capacity
In pots with earth	10 days	88.0 %
Felt germinator	7 »	91.5 %
With the Nobbe apparatus . . .	7 »	94.0 %
» » Liebenberg » . . .	7 »	93.0 %
» » Hanneman » . . .	9 »	90.0 %

The effect of different methods or of apparatus being excluded, how are we to explain the varying germinating power of seed lots having the same origin?

The cultivators and producers of seed follow in each case the empirical method of calculating in every lot the percentage of germinating seeds, without considering their qualities and specific properties.

Now in most cases the seeds of forest trees may be divided into the following groups:

A. Developed normally: (*a*) those germinating.
(*b*) those which have lost the power of germinating.
B. Empty seeds developed parthenocarpically.
C. Seeds damaged . (*a*) externally
(*b*) internally

Hence, as the proportion between the different groups varies even for the same plant in each lot, the percentage of germinating power has such a relative value that the results of the different examinations cannot be compared. In this connection should be considered the absolute power of germinating. By "absolute power of germinating" is understood the percentage of seed that has germinated and which belongs only to group *A*.

In practice great importance is attached to the *percentage of utilizable* seeds; that is, the percentage of seeds that have germinated on the amount of non-selected seeds. This is indicated by the formula $\frac{R \times Kz \times Ke}{10\,000}$, where R = the pureness expressed in percentage of weight; Kz = percentage of germinating seeds; and Ke = percentage of seed germinating within a fixed time on the total amount of germinating seeds. The value of this percentage of utilizable seeds is absolute only when there is a direct proportion between the number and weight of the seeds. Otherwise it gives us only approximate conclusions within very wide limits.

From what has been said two points are clear:

1. The necessity of determining the absolute power of germinating.

2. The usefulness of estimating in practice the percentage of utilizable seeds; this gives the value of a lot as material for cultivation.

The question of the yield of forest trees in good seed has acquired greater importance now that the method of artificial forest regeneration is gaining more and more ground.

The number of fruits can not give an exact idea of the value of the yield. The empirical determination of the percentage of empty seeds, if it is sufficient in practice, is certainly unsatisfactory for the man who is looking for the cause of an increased or diminished yield.

For this purpose it is necessary to determine the *energy of fructification:* that is, the percentage ratio between the number of flowers and the number of seeds, normally developed and capable of germinating.

Under equal conditions of the surroundings in all the stages of the development of the seed, the energy of fructification shows how far the conditions themselves approached the optimum. This method besides supplying very exact figures for estimating the yield, also allows the data obtained in successive years to be compared, and clearly brings out the causes which affect the formation of the seed.

The following conclusions may be drawn:

1. Very exact methods should be used in determining the productiveness and germinating power of the seeds.
2. The determination of productiveness and of energy of fructification should be made in surroundings, either identical or comparable, and a register should be kept of the conditions of increase and of the appearance of causal factors that may influence the yield.

CEREAL AND PULSE CROPS.

651 KOSUTANY, Dr. THOMAS. **The Excellent Quality of Hungarian Wheat** (1). — *Közlctek.* Budapest, 7 février 1912.

Hungary

It has been stated that deep ploughing, the use of steam ploughs and especially the increased consumption of artificial manures have caused a softening of the Hungarian wheat, which is said to be inferior to what it was when the crops were less abundant. Its alleged former hardness is attributed to the old fashioned peasant cultivation.

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(1) See *B.* Feb. 1912, Nos. 325-326. *Kisérletügyi Közlemények,* Budapest 1906. — *Ungarische Mehl und Weizen* von Dr F. KOSUTANY. — *Der Müller,* Amtliches Organ des Verbandes deutscher Müller, 18. Sept. 1908. — Dr A. MAURIZIO. *Getreide, Mehl u. Brot. Das Getreidekorn, seine Bewertung u. Behandlung in der Praxis* etc. von Dr G. F. HOFFMANN, Prof. am Institut für Gärungs-Gewerbe in Berlin. I. Bd.: *Die Bewertung des Getreides.*

The author, on the strength of his chemical investigations, was almost alone in impugning these affirmations. He attributes the inferior quality of the last years' wheat to unfavourable climatic conditions.

With the object of calming the apprehension of agriculturists in so interesting a question, it was decided that every year 50 typical samples of wheat of the various provinces should be collected and examined chemically by M. Kosutány.

The author accomplished his task with the greatest care and already in 1906 he was in a position to declare positively in the *Kisérletügyi Kozlemények* that the quality of Hungarian wheat had not changed nor deteriorated, that the more intensive culture had not impaired its hardness, and lastly that the judicious use of artificials had not only increased the yield of wheat but also improved its quality, provided always that the weather be favourable.

As a proof that Hungarian wheat has not degenerated, the author mentions the 1911 wheats supplied by six different localities in Hungary which weighed up to 850 gr. per litre (68 lb. 2 oz. per bushel).

According to M. Kosutány the Bánát or Tisza wheat, as almost all Hungarian wheat, is an autumn wheat. It is typical of the wheat grown in the plains (Steppenweizen). It is classed in the species *Triticum vulgare*, but both by its form and its quality it is very closely allied to hard wheat (*Triticum durum*). The grain is hard, red with a shade of brown or grey or even yellow according to the weather and to local circumstances. It is somewhat below average size, often angular and elongated. The yellower the wheat the less hard it is. This wheat contains much gluten, it bakes well, and may be considered as one of the best kinds of wheat. Nevertheless it is said not to be resistant to cold and to be a spring wheat (1).

The grain of Hungarian wheat is smaller and richer in protein than the wheat of Western Europe: 15.4 % on average of the dry matter, according to the analyses of M. Kosutány; the average weight of 1000 grains is 32.6 grams, the maximum 43.2 grams (1.14 and 1.51 oz. respectively).

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(1) See *Das Getreidekorn, seine Bewertung u. Behandlung*, von Dr. G F. HOFFMANN, pp. 110-115. (*Ed.*).

According to M. Kosutány, Hungarian millers do not like spring wheat, probably because it may be considered as a hard wheat.

The Budapest Exchange of agricultural produce has adopted the following regulations respecting wheat: It is not to be exported if it contains: more than 2 % in weight of smutty wheat, of vetches, darnel, or in general other seeds; more than 0.5 % of one grained spelt, of hard or of white wheat; and lastly more than 1 % of sprouted grains.

Owing to the high esteem in which real Hungarian wheat is held it has become customary to give this name also to foreign wheats sent to Hungary thence to be exported to the North and to the West.

The opinion of Hoffmann that Hungarian wheat does not stand cold is not borne out. On the contrary the author is convinced that Hungarian wheat stands the winter better than any other foreign wheat.

The author, having thus by his careful researches extending over a period of 12 years, completely rehabilited Hungarian wheat, concludes that it is necessary now to preserve its high repute, and with this object in view he deprecates the importation of foreign wheat seeds esteemed for their high yields, because, though sometimes they give heavy crops under the extreme climate of Hungary, they often fail and damage the reputation of Hungarian wheat and flour.

ROOT CROPS.

652 EREMIEEVA, FU. **Injury to Root Plants by Frost.** (Vliianie Reannikh Samoroskov na Korneplodi), — *Juseno-Russkaia Seksko-Khosiaistvennaia Gaseta* (Journal of South Russian Agriculture), G. 1911, No. 48, pp. 48-49. Kharkov, 22 Dekabria 1911.

This paper describes the injury done by frost to potatoes and mangels in South Russia.

Russia

The heavy rains of September prevented the potato crop being lifted till towards the middle of October. On October 3rd and 4th there were severe frosts early in the morning and all the root plants suffered more or less, and especially the late potato variety « Voltmann ». It was found that the action of the frost passed along the stems and penetrated to the tubers still connected with them;

whereas those free in the soil, even when near the surface, were unhurt.

The author considers that the mangels and potatoes which rot in the clamps during winter are the ones that have got frosted before lifting.

As the effects of the frost are sometimes invisible, and it is no easy matter to pick out the affected roots, lifting should be completed as early as possible, before the October frosts.

FORAGE CROPS. MEADOWS, AND PASTURES.

658 CROWTHER, CH. and RUSTON, A. G. **The Influence of Time of Cutting upon the Yield and Composition of Hay.** — *The Journal of Agricultural Science*, Vol. IV, Pt. 3, pp. 303-317. Cambridge, January, 1912.

Great Britain: England

It is well known, especially on the Continent of Europe, that a delay of only a few days in cutting may lead to serious depreciation in the value of the hay crop. This question is of great practical importance also in England, where hitherto it has received but little attention, especially as there are many possiblities of variation (owing to climatic conditions) from the general conclusions drawn from continental work.

Accordingly experiments have been carried out on an estate in Yorkshire in two neighbouring fields with similar soils, in 1909 and 1910. The two hay crops were grown in rotation with cereals. The fields were divided into four plots according to the different dates of cutting (four, from 10 June to 3 August, 1909, and four from 9 June to 21 July, 1910).

The seeds mixture was as follows:

Perennial Rye Grass	2	parts;	Alsike......................	3	parts
Italian Rye Grass	2	»	English Single-Cut Cowgrass	1	part
White Clover	4	»	Chilian Red Clover.........	1	»
Trefoil	»	»	Ribgrass....................	[illegible]	»

The manurial dressing given on May 11, 1909, was: nitrate of soda, 1 cwt., superphosphate, 2 cwts., sulphate of potash, ½ cwt., and muriate of potash, ¼ cwt. per acre. The rainfall in 1909 from April to Aug. 3 was 12.48 inches, and in 1910 from April to July 21 it was 9.29 inches.

The analysis of the 1909 crop gave the following chief points of interest:

1. The steadily increasing proportion of crude fibre throughout the whole eight weeks.
2. The gradual fall in the proportion of *amides* up to the third cutting, after which reduction was very pronounced.
3. The fall in the proportion of true protein during the moist latter half of June, followed by a steady rise up to the period of the fourth cutting.
4. The gradual reduction in the proportion of carbohydrates after the second cutting.
5. The relatively high proportion of pentosans throughout the whole period.
6. The increasing of the ash in silica, whilst the proportions of K_2O and P_2O_5 tended to fall.
7. The crop became steadily less digestible as growth advanced, the maximum yield of valuable nutritive matters being attained at the third cutting.

Adding these results to those of 1910 we reach the following general conclusions which supplement what has been hitherto known.

1. The composition of hay steadily changes throughout the period commonly covered by the hay-making season.
2. The nature of the change depends to some extent upon the character of the season.
3. In both seasons there was a steady fall all round in the digestibility of the hay, which in the end more than counterbalanced the increase in weight of the crop.
4. In both seasons the best results were obtained by cutting about the beginning of July. A certain latitude in the time of cutting — a week, or 10 days — may be allowed, without doing much harm. But after the middle of July an appreciable deterioration set in.

654 - O' CONNOR, J. M. B. **Berseem or Egyptian Clover** (1). — *The Producers' Review*, Vol. VI, No. 10, pp. 476-477. Perth, January 20, 1912.

Australia At the Brunswick State Farm, Western Australia, six acres of high land were sown last year with Berseem or Egyptian clover

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(1) See *B*. Nov. 1910, p. 61; March 1911, No. 812; Augt.-Sept.-Oct. 1911. No. 2566. (*Ed.*).

(*Trifolium Alexandrinum*), 4 lbs. of seed per acre, together with half a bushel of Italian rye grass, and half a bushel of barley per acre, to act as a cover crop for the young clover plants.

The land was manured with 1 ½ cwt. of Thomas' phosphate, and top-dressed during the growing season with 5 cwt. of lime to the acre, and a month later again top-dressed with blood manure (1 cwt. per acre). The soil is a light loam, intermixed with gravel, with a clay subsoil.

Although it was not irrigated, this crop showed a splendid germination and quick growth of succulent stems and leaves during the early winter months, when lucerne and other grasses were at a standstill. Animals are particularly fond of Berseem, and the experiment has been in all respects so satisfactory that the Department is arranging to distribute the seed in small lots to farms at cost price.

655 COUSTON, F. **Arabian Lucerne on the High Plateaux of Algeria.** (La Luzerne d'Arabie sur les Hauts-Plateaux de l'Algérie). — *Bulletin agricole de l'Algérie et de la Tunisie.* Alger, 1911.

Algeria

At Bordj-bou-Arrérdj, at 3 000 feet above sea level and under a dry climate experiments have been made with three kinds of lucerne, namely: Arabian Lucerne (from Mitidja), Sétif Lucerne, and one kind indigenous to the country.

They were sown on April 9th 1911, in lines 3ft. 3 in. apart (Ryf system) on ground ploughed in the spring.

Owing to want of rain, the plants did not sprout till May; on the 15th of June they still showed but thinly and their vegetation was not vigorous. After the May rains and again after the July storms the horse hoe was used to prevent the drying of the soil.

In October, after the first small showers, the Arabian lucerne possessing powerful tap-roots, had formed vigourous tufts, showing that it had taken possession of the soil, notwithstanding the exceedingly dry summer of 1911.

The Sétif lucerne followed it closely but without equalling it.

The native lucerne proved much inferior, germinating very irregularly.

In a comparative experiment on irrigated plots, Arabian lucerne again took the lead, both in its early sprouting and in the development of its stems.

Though these tests are still in their preliminary stages, the Author communicates his first observations in case they might be useful to other agriculturists who are following similar investigations.

FIBRE CROPS.

656 SHERRARD, G. **Report on the Cultivation of Cotton on the Experimental Farms of Bengal during the Year 1910-1911.**— *Department of Agriculture Bengal, Quarterly Journal,* Vol. V, No. 2, pp. 59-64. Calcutta, 1912.

British India: Bengal

Early in March 1911 the Imperial Cotton Specialist visited the Experimental Station at Chinsurah in company with the Deputy Director of Agriculture. His Report on the cotton grown on the lower land, at the general level of the farm, is not favourable. The inevitable conclusion to be drawn, he says, from these experiments is that the conditions of soil and climate are not in any way suitable for cotton cultivation in the deltaic area of Bengal, where more highly renumerative crops, such as rice and jute can be grown ; experiments directed with a view to introduce this cultivation, should not be persevered with, but the trials of Cambodia and Bhuri cotton on a small scale, for a few years, could be continued, just to test the behaviour of these varieties in an unsuitable environment.

The opinion of the Imperial Cotton Specialist is confirmed by the results of the growth of cotton on five farms, during the year under report, as will be seen from the following tables; and the writer thinks that the Department of Agriculture may safely conclude that cotton is not a paying crop under ordinary circumstances on the Gangetic plain in the Bengal Province.

On the Dumraon and Burdwan Farm the crop entirely failed to produce bolls.

On the Bankipur, Chinsurah and Hazaribagh Farms the following results were obtained.

Bankipur Farm.

Variety —	Cost of Cultivation per acre —			Outturn per acre —	Value per acre —			Profit per acre —			Loss per acre —		
	£	s.	d	lb.	£	s.	d.	£	s.	d.	£	s.	d
Bhuri	1	4	0	120	3	5	4	2	1	4	—		
Cambodia	1	[illegible]	2	12	0	5	4	—			0	18	10

Chinsurah Farm

Variety	Cost of Cultivation per acre	Outturn per acre	Value per acre	Profit per acre	Loss per acre
	£ s. d.	lb.	£ s. d.	£ s. d.	£ s d.
Bhuri, I Class Land	10 8 0	548	14 8 0	4 0 0	—
Cambodia, I Class Land	11 5 2	321	8 2 8	—	3 2 6

Hazaribagh Farm.

Variety	Cost of Cultivation per acre	Outturn per acre	Value per acre	Profit per acre	Loss per acre
Bhuri	3 1 11	411	11 17 4	8 15 5	—
Cambodia	3 1 11	411	11 6 8	8 4 9	—

The varieties Bhogila and Deshila were also tried.

The high cost of cultivation per acre at the Chinsurah Farm is in part due to the large sums spent on meeting the attacks of insect pests, among which were: Behar Hairy Caterpillar (*Diacrisia obliqua*), the cotton Leaf-roller (*Sylepta derogata*), and the Red Cotton Bug (*Dysdercus cingulatus*).

It must also be noted that the value and profit per acre given in the tables are based on the figures derived from samples of the various varieties sent from each farm to the Imperial Cotton Specialist and forwarded by him to Messrs. Tata Sons & Co., Bombay, for valuation. Values are therefore in excess of that which could be obtained for the cotton locally.

WILLCOCKS, sir WILLIAM. **Cotton in Egypt in Relation to Irrigation, Drainage, and the New Hydraulic Works.** (A crop of Ten Millions Cantars). (Le Coton en Egypte en rapport avec l'irrigation, le drainage et les nouveaux travaux hydrauliques. Une récolte de dix millions de cantars). — *Bulletin de l'Union des Agriculteurs d'Egypte*, N. 81, pp. 294-315. Cairo, 1911. **657**

Egypt

From 1891 to 1900 the Nile waters at the Delta dam reached a height of 14 metres (45 ft. 6 in.) and the area under cotton, 1 000 000 feddans (1 141 800 acres), produced 5 450 000 cantars (1) (about 241 000 tons), or an average of 5.5 cantars per feddan (about 4 $^1/_4$ cwt. per acre).

It was in that period that the greatest crops of Egyptian cotton were harvested. In 1903 the Assouan dam began to act. From

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(1) 1 cantar of ginned cotton = 99.049 lb
» » unginned » = 311.366 lb.
The first is the most commonly used. (*Ed.*).

1903 to 1910 the area under cotton increased by 308 700 acres, but the yield of cotton per acre, diminished by 0.85 cwt. This lesser yield is said to be due to the great extent of inferior land planted to cotton of late years, but this is not true, because just the reverse happens in the Delta, where the land that was formerly of inferior quality and salty, and yielded but scantily, has been drained and improved, and produces to-day splendid crops. On the contrary it is from the good lands that the poorer crops are harvested.

The excess of water which favours the cultivation of maize, so dear to the fellaheen, has protected the irrigated area against drought, but is has at the same time increased the danger from the Cotton boll worm which, under the natural climate of Egypt could not have been injurious. If the Government had not acted promptly the worm would have destroyed the whole crop in wet years. The clover fields are adjacent to the cotton fields; the former are irrigated in June and the food they afford enables the worm to bridge over the critical period of its existence. The worm feeds on clover until the young cotton plants (now sown much earlier than formerly) give enough shade to shelter it.

Between the 15th of June and the 15th of July the perfect insects lay their eggs on the leaves of all the tender plants they find, and in five days time the eggs hatch out. If the cotton fields are kept dry and the plants are hard and fibrous, millions of worms perish, if on the contrary the plants are tender and the air is moist, the worm destroys the plants, and going through its metamorphoses it threatens greatly next season's cotton.

It must also be noted that the high level canals have permanently raised the spring water table, and have thus reduced the depth of the soil in which cotton can grow, and this to such an extent that in a great portion of the Delta instead of a resistant and hardy plant with long roots. a tender plant with short roots is produced, which cannot live without frequent watering. All this has favoured the development of the worm. To obviate these drawbacks the canals must be excavated to the depth they had formerly, and they must be allowed to irrigate freely only when they are full. Maize must not be irrigated in June and July but only during the month of August. If the growing of clover can not be prevented it can be forced, so as to have one good cut in April instead of three every season; then another crop should be introduced into the rotation, or the land allowed to lie fallow after the end of April.

The land situated towards the North of the Delta, about 1 235 000 acres in extent is for the most part more or less salty und lies above the level of the lakes. The whole of it is susceptible of improvement by irrigation and drainage; because its Delta formation renders drainage very useful. It must not be forgotten that the want of the red muddy water would spell disaster for Egypt. The only means of ensuring this rich red flood water for the above lands is by providing the canals with outlets. In the Nile Delta as well as in those of the Tigris and of the Euphrates it is essential to allow the muddy flood water a free course in the canals so as to give the lands the benefit of the silt carried by the water; it is equally important to enable the infiltration water to drain off into the deep drains, in order to prevent the salt which impregnates the soil from rising to the surface, and to collect these waters into one and the same channel.

Thus, by providing the higher portions of the soil of Egypt with canals and its low lying parts with drainage; by providing the canals with outlets for conveying the red flood water to the most distant fields; by keeping the spring water table in the South fairly low by means of a suitable irrigation and in the North by good drainage; by turning the water from the reservoirs towards the fallow lands of the North; by giving the cotton region of the South as dry and warm a summer as the seasons allow, and lastly by utilising the flood waters at the natural and inevitable time, Egypt will be able to yield about 10 000 000 cantars (about 464 000 tons) of cotton, $^{9}/_{10}$ from Lower Egypt and $^{1}/_{10}$ from Upper Egypt.

Nevertheless all this enormous crop would be menaced if a flood like that of 1898 were to happen again. At an expense of £5 000 000 the Wadi Rayan reservoir could be constructed; this work would protect Egypt from premature floods. In addition, two barrages on the White Nile, at Omdurman and at Gordon's Tree, the cost of which is estimated at £1 600 000 would diminish considerably the duration of prolonged and excessive floods.

HAUTEFEUILLE, L. **The Fibre Crops of Java.** (Le congrès des textiles de Soerabaya). — *Journal d'Agriculture tropicale*, 12^{e} Année, No. 127, pp. 4-7. Paris 31 Janvier 1912. 658

This rapid account of the Textile Congress notices some recent work on various fibres.

Java After having remarked upon the slight consideration given by the Congress to the Russian fibres and to jute, the author mentions a report by M. W. A. Zegers Rijsez on *Hibiscus cannabinus*, deccan hemp, which gives splendid crops in Java.

Crotalaria juncea, which succeeds wonderfully at La Pho (Tonkin), does not appear to give good results of Java.

Cotton is the chief subject treated in two papers by Mesrs. Breda de Haan and D. J. G. van Setten on local native crops.

Textile *Agave* holds an important position in those parts of Java subject to relative drought. The Congress recognized the importance of the subject at the present time and followed with interest the communications of E. de Knijff, general secretary of the Congress, the remarks of the director of one of the most important Java plantations and Professor Lister H. Dewey's important contribution which rectified several errors and pointed out with precision the incomplete data.

A useful discussion took place on the distances to be kept between the plants, on the selection of varieties and of the soil, on the best time for the harvest, on its further treatment and packing. A resolution was adopted in favour of large central works rather than small ones for preparing the fibre.

Interesting papers were also read on " Poeroen " (*Lepiconia mucronata*), on " Mendoeng " a variety of the same plant and on several species of *Pandanus*.

The insuccess of Abaca, Manila hemp, was confirmed. This fibre seems to succeed only in the Philippines and in those islands having similar soils and climate.

As kapok represents one of the chief items of the wealth of Java, the sitting devoted to it was one of the most important. A paper on the kapok trade by Mr. W. Cock-Buxing was read, as well as a complete study by Mr. F. L. Bley on its requirements, cultivation, pests, crop and preparation of the fibre.

Eriodendron anfractuosum seems to be the most widely spread tree in the island. About 8000 tons of kapok are exported every year.

Pine apple fibre and the various ways of preparing cocoa-nut fibres were also discussed.

SUGAR CROPS.

659

GRABNER, E. **Sugar-Beet in Hungary. Cultural Precautions for 1912 to provide against the Lack of Seed.** (1) (Mittehetünk a czukcorrépa vetömaghiányból eredö bajok elháritúsára ?). – *Kozteleh*, No. 18. Budapest, 2 March, 1912.

Hungary

The effects of lack of success in the attempts to improve the cultivation of beets for seed in Hungary are particularly felt this year owing to the smallness of the beet-seed crop in Germany last summer. Hitherto the only disadvantage of the lack of local seed has been that a sum of 1 ½ to 2 million crowns (£60 000 to £80 000) has gone abroad for the purchase of seed; but this year the actual beet crop is threatened.

While the crop of seed in Germany last year was only about a fifth of the normal, the Russian crop was fairly good in quantity, though poor in quality As most of the seed-merchants went to Kiew, the centre of the Russian trade, the price went up in less than six weeks from 30 marks to 130 marks per 50 kilos (from £1-10*s* to £6 10*s* per cwt.), and the stock was soon exhausted. Fortunately, the Hungarian factories have permanent contracts with the German merchants, so that they run less risk than other countries, such as Germany, where the growers are advised to reduce their sowings by 30 %. Nevertheless there may be a difficulty in getting seed for second sowings, so that every precaution must be taken that the first sowings are successful; more care must be taken than usual, as even the seed from the best German seedsmen is prematurely ripened.

While, however, the quality of the seed is not good, this may be counterbalanced by the fact that it contains more germs per unity of weight than usual; according to German experiments 1 kg. of 1911 seed will in 12 days give 100 000 to 135 000 seedlings, as compared with 70 000 to 85 000 in normal years.

Another circumstance making careful cultivation more important than usual, is that there will be less area under sugar beets, and the consequent rise in price ought to make successful crops highly remunerative.

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(1) See *B*. Jan. 1912, No. 111. (*Ed.*).

The primary condition for success in sowing is thorough preparation of the soil, so as to obtain a fine and even tilth in which the seed can be sown at a regular depth; this will ensure even germination, which will further protect the crop from parasites.

After drilling, the ground should be well rolled; Kuffner rolls weighing 88 lb., used on the sugar beet farm at Diosseg, have done excellent work. If one of these is fixed behind the drill, and at the same time an iron-wire brush is fixed in front to cover in the tracks of the draught animals, perfect drilling results.

Drilling should be got through as early as possible, provided the season is not backward. A good plan is to drill in a little barley — 7 to 8 lb. per acre — with the beets, so that if the germination of the beets is slow, the rows can be seen by the quicker-growing barley, and hoeing can begin earlier: of course the barley can easily be cleared away at singling time.

After drilling it is well to roll thoroughly with segmented or toothed rollers.

It is much to be hoped that the area sown will not diminish in spite of the unfavourable circumstances of this year.

RUBBER, GUM AND RESIN PLANTS.

660 HELFFERICH, EMIL. **The Progressive Development of Rubber Culture in South East Asia.** (Die weitere Entwicklung der Kautschukkultur in Südostasien.). — *Der Tropenpflanzer.* 16 Jahrg. Nr. 1 pp. 15-34; Nr. 2, pp. 73-87. Berlin, Januar und Februar, 1912.

S. E. Asia

The rubber boom is passed. In spite of all prophecies, the price of rubber has returned to its normal level, that, namely, which is determined by the actual relations between demand and supply.

It is now clear that *Hevea* is the most desirable rubber culture, as well in West Africa as in South East Asia where its superiority to *Castilloa* and to *Ficus elastica* is distinctly marked. The latter especially, which was for a long time preferred by the Dutch, has been very disapponting.

As regards *Manihot* opinions are still divided, but in any case it is certain that it is not superior to *Hevea*. The rough fashion of preparing the land for rubber planting, as largely adopted on English estates, has been proved to be a great mistake. The trees were simply felled and burnt, and no further attention was paid to the soil. The roots were left in the ground, and the wood, which had escaped the fire, was only removed where the *Hevea* plants were actually to be placed.

During the time of the boom, all the seed that could possibly be got was planted, but now care is taken to select the seeds that come from plantations bearing a good name.

As regards the space between the plants, the smaller distance of 12 × 12 feet has now been given up. The usual distances are as follows:

13 × 18 ft = 186 trees per acre
15 × 15 » = 193 » » »
18 × 18 » = 134 » » »

Intercalary cultures have been mostly abandoned in the Malay Peninsula. But on Java and Sumatra the Robusta coffee is intercalated with very satisfactory results.

According to English opinion, *Hevea* grows better in the Malay Peninsula than in Java. This is true where in Java it has been planted in soil already cultivated, or on secondary forest land, but on virgin forest land it grows as well as in the Straits. There are many different methods of tapping, but the one at present most in favour is the half fish-bone incision extending over one fourth of the circumference of the trunk.

The quality of the rubber depends to a large extent on the age of the trees. The rubber of young *Heveas* is softer and of less value than that from older trees.

At Pasir Oetjing in Java, with plants aged from 4 to 6 years, last year's yield was as follows:

1st Quality	63.87 ½ %
2nd »	11.28 »
3rd »	17.72 ½ »
4th »	7.12 »
	100.00 %

The supply of land suitable for rubber plantations has for a long time exceeded the demand. All fear of lack of labourers has passed away. Chinese immigration is constantly increasing. The immigration of Java Coolies to the Straits was never so important that its diminution or cessation could endanger the rubber industry there. The want of labourers on Sumatra is chiefly covered by Java. On an average wages on Java are only 50% of those in Malacca and on Sumatra. The Chinese are not so clever in tapping as was expected.

661 WILDEMAN, E. DE. **On the Mechanical Extraction of Rubber.** (A propos des Procédés d'Extraction mécanique du Caoutchouc). — *Journal d'Agriculture Tropicale*: 12e Année, No. 127, pp. 2-4; Paris, 31 Janvier, 1912.

Belgian Congo

Experiments have recently been made in Paris on the Extraction of rubber by means of the Guignet apparatus, and Mr. Wildeman observes that he has always been in favour of extraction by beating. Some account of the treatment of *Funtumia elastica* by the natives of the Belgian Congo may here be given.

The Bayanzi of the lower Kwilu (Belgian Kasai-Congo) cut down the tree when its diameter measures 15 to 20 cm. (5.90 to 7.87 in.) at its base. The trunk is stripped of its branches, which are thrown away, and then heated by exposure to a fire, until the bark detaches itself, when it can easily be removed.

The bark is first macerated and then beaten, in the village, like that of *Landolphia Thollonii* and other rubber-producing lianas. The first mass obtained is usually plunged into boiling water. As a rule the natives only do this once, so that the rubber is very impure, a second beating and boiling being greatly needed.

The most unsatisfactory part of this rudimentary process is the exposure of the bark to the fire.

It is, nevertheless, necessary. If the latex does not coagulate, before the beating, the latter is useless. But if the heat be too great, the bark may be partially burnt, and the quality of the rubber greatly reduced.

It is not the process itself, but its faulty application that spoils the rubber, and it is for mechanicians to invent an apparatus perfectly adapted to the conditions. According to Mr. Wildeman, mechanical methods for extracting, either directly from the plant, or from the latex, the rubber contained therein, are sure to be adopted in the future.

662 GRISARD, JULES. **Wood-Oils**. (Les Huiles de Bois). — *Bulletin de l'Office Colonial*, No. 49, pp. 1-7. Melun, Janvier 1912.

French Indo-Cina

Although it is incorrect to use the name "wood-oil" for the liquid oleo-resin derived from exudations from the trunk of species of *Dipterocarpus*, yet it is better to retain it to show the origin of the product and to avoid confusion.

The species of *Dipterocarpus* of the French possessions in the Far East which furnish most oleo-resin, are in order of importance: *D. alatus*, *D. tuberculatus*, *D. intricatus*, *D. artocarpifolius*, and *D. Jourdaini*. Besides these, there are *D. incanus*, *D. zeylanicus*, *D. hispidus*, *D. gracilis*, and *D. littoralis* of the British and Dutch Indies (1).

The industrial and medical use of this oil is constantly extending.

The oil is collected from special incisions; it goes on flowing for as much as six months, but the time varies with the species. The oil obtained during the dry season is the best. Some trees give as much as 45 gallons a year, but 18 gallons is an average. The operation may be repeated ten times without interfering with the growth of the tree.

The colour of the oil varies from yellowish white to blackish brown according to the species of *Dipterocarpus*. It is composed of a resin and a hydrocarbon essential oil, slightly yellowish, with a slight odour, and soluble in absolute alcohol; from the resin is extracted a crystallisable acid called gurjunic acid.

The oil is used for calking the native boats, making torches, polishing furniture and other articles, and for preserving wood. It has also been tried in the manufacture of linoleum. The white oil, or " chondrau ", the most prized, is used in China in getting up lacquer work.

By distillation, a gas with high lighting-power might be obtained from wood-oil.

The medicinal properties of this oil are similar to those of copahu; it is used under the name of " gurjun balsam ", and is also exported from Siam and the Malay peninsula; in London it is sold under the name of "East Indian copahu".

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(1) *Dipterocarpus grandifluus* (Philippines) gives a resin-balsam, called " apitong oil " or " balao balsam ", containing 25-40 % of ethereal oil as well as resin and water. *D. vernicifluus* (Philippines) gives " pana oil " or " malapaho ", containing c. 35 % ethereal oil,40 % resin, 25 % water. *D. turbinatus*, *D. alatus*, *D. laevis* (Burma) give the resin-balsam known as " kanyn oil ", which, mixed with " inolls " (from *D. tuberculatus*, *D. incanus*, *D. obtusifolius*, *D. pilosus*, *D. Griffithii*, all from Burma), forms the commercial product known as " gurjun balsam ", " balsamum garjanae " or " wood-oil "; this contains ethereal oils (20-82 %), resin (up to 54 %), bitter principles, and acetic acid. Other species yielding oils are: *D. angustifolius*, *D. retusus*, *D. hispidus*, *D. littoralis*, *D. zeylanicus*, *D. trinervis*, etc. all from South-East Asia. (C. Wehmer, *Die Pflanzenstoffe*, pp. 499-500. Jena, 1911). (*Ed.*).

The fruit of the abrasin (*Aleurites cordata* Stend.) contains three large seeds with kernels, which furnish abrasin oil, whose yield is 50 to 60 % of the weight of the kernels, or 20 % of the whole seeds.

This oil is limpid, colourless and nearly solid when cold, but reddish yellow and viscid when hot. It is used for protecting wood, iron and ropes from damp. In China and Japan it is used for ordinary painting. It may be used for lighting without any preparation. When suitably prepared it can be used as putty in glazing, as a varnish, and for soap-making. It is used for skin-diseases and for warming the surface of the body after asphyxiation. Further, it is a strong insecticide.

The candlenut (*Aleurites triloba* Forst.) (1) contains a kernel which yields a fixed oil, which is limpid and of a pale yellow colour, and has a pleasant smell and slightly bitter taste. The kernels yield 50 to 60 %. The oil is used for soap-making, drying colours, dressing leather, and lighting lighthouses. In Tonking it is extracted from the fresh nuts and used as food. The cake makes an excellent manure, but it is dangerous for feeding stock, though it has been used with success for poultry and pigs mixed with sweet fruit, such as papayas and guavas.

VARIOUS CROPS

668 **The Conditions of Tobacco-growing in Hungary**. Official Publication of the National Hungarian Farmers' Association. — *Köztelek*, 22 Year, No. 13, pp. 431-434. Budapest, 14 February, 1912.

Hungary

Twenty years ago tobacco cultivation in Hungary was very flourishing, and heavy crops of good quality were produced.

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(1) Native of Oceania; now cultivated in India, Java, the Moluccas, the West Indies, Reunion, and South America. The seed (candlenut) consists of 57 % husk and 43 % kernel; the latter contains 3.7-9 % water, 59-64 % fat, 17.4-23.7 % protein, 5.9-6.8 % N-free extract, 1.6-2.7 % crude fibre, 2.8-4.3 % ash. The oil-cake contains 35-47 % protein. The oil contains glycerides of linoleic (30 %), stearic, palmitic, myristic, and oleic acids, besides many free fatty acids (to 56.4 %), and elaeomargarinic acid. (*Loc. cit.*, p. 434).
(*Ed.*).

Lately, however, owing to changing conditions, particularly the increase in the price of land and of labour, this crop has become much less important. Increase in the import duties has not served to stop the diminution.

The most serious side of the question is the loss of employment of the labourers who are specialists in tobacco-cultivation, and form a kind of caste not fitted for other work, having followed this occupation for generations.

On the initiative of M. Edmond de Miklós, the proprietors interested in the question met to form regional assemblies in the chief centres of the industry; the National Federation of Farmers' Associations and the General Direction of the Tobacco Monopoly were also represented.

A resolution was passed requesting the Ministry of Finance to carry out the following measures as soon as possible:

1. That the Ministry should modify the rules at present in force on the manner of delivery and the duties, so as to simplify the classification of the qualities and arrange for the prices to be from 55 to 120 crowns (£ 2. 5*s* 10*d* to £ 5.) according to the different classes and species of tobacco, and that these measures should start from the coming year.
2. That the Ministry should abolish the tax on concessions for tobacco-growing, which has no reason for existing.
3. That the allowances of indemnity on transport be generalized, regardless of distance, and be fixed at 5 fillers (½ *d*) per quintal per kilometer.
4. That the juridical and administrative relations between the proprietors and the merchants should be regulated.
5. That regulations should be made to allow of the possibility of insuring only tobacco against hail, without having to insure all the other crops on the same holding.

According to very careful data presented at the regional assemblies, it is impossible, at the present prices of land, labour and tobacco, for either proprietor or labourer to get a profit from this crop.

If this situation is not soon modified, a large number of proprietors will be obliged to give up this very important branch of Hungarian farming, to the loss of the Tobacco Administration and the country as a whole.

From detailed investigations it appears that the cost of cultivating an area of 4 arpents (5 3/4 acres), which is the amount that can be undertaken by an average labourer's family, including rent, cultivation, manuring, etc., is 952 crowns (£39 13*s* 4*d*); if the crop be taken at 10 qls. per arpent (14 cwt. per ac.) and the average sale-price at 44 crowns per quintal (18*s* 4*d* per cwt.), the gross return is 880 crowns (£36 13*s* 4*d*) for the proprietor, and the same for the labourer. This sum does not cover the expenses of the proprietor and gives to the labourer a daily wage of 1 crown 24 fillers (1*s* 0 ½*d*) not half that paid in other branches of agriculture.

Several proprietors present at the assemblies considered that these figures were too high, and that the real state of affairs is even worse than represented.

664 LUNDIE, MARSHALL. **Notes on Investigations on Some South African Tobaccos.** — *South African Journal of Science*, Vol. VIII, No. 6, pp. 186-191. Cape Town, January 1912.

Union of South Africa

The cultivation of tobacco recently became so important in Cape Colony that the Government appointed an expert to investigate it and draw up a report. From this it appears that the cultivation of tobacco is carried on in a very primitive manner, an excessive manuring with sheep's dung being used. This brings about an excess of chlorides, with the result that the tobacco has much too high a percentage of nicotin and of ash. Analyses of different kinds of South African tobacco prove that there are insufficient quantities of lime and potash.

In Cape Colony, sheep's dung must be used as a fertiliser, but its evil effects may be to a large extent counteracted by green manuring.

The following results are the average of at least three determinations made most recently on a number of tobaccos obtained from new countries like the Transkei and Rhodesia.

Locality, etc	Nicotin per cent.	Ash per cent
Virginian Leaf (Hester), flue-cured, Rhodesian Grown	2.15	12.15
Turkish Tobacco, Rhodesian Grown	2.52	10.25
Pondo Tobacco, Elliotdale District, Pondoland . . .	1.45	14.58
Kafir Tobacco, Willowvale District, Transkei	1.13	14.26
Karoo Tobacco, Oudtshoorn	4.92	19.16
Cango Tobacco, Oudtshoorn	1.44	12.02

It is of interest to compare these results with the composition of some of the more famous varieties of tobacco, most of which contain 17.2 % of ash, whereas the percentage of nicotin varies.

Best Havana	**Tobacco**	**contains**	2.5	per	cent.	of nicotin
Brazil	»	»	2.0	»	»	»
Sumatra	»	»	4.12	»	»	»
Kentucky	»	»	4.53	»	»	»
Maryland	»	»	1.26	»	»	»
Domingo	»	»	0.82	»	»	»
Ohio	»	»	0.68	»	»	»

Those parts of South Africa which have summer rains, Transkei, Natal, Transvaal, and certain parts of Rhodesia, could undoubtedly produce very high class tobaccos, were proper methods of cultivation applied.

MARKET — GARDENING.

HITIER, H. **Market Gardening in France.** (La production horticole en France et son commerce). — *Bulletin de la Société d'Encouragement pour l'Industrie Nationale,* 110e Année, Tome 116, No. 10, pp. 497-509. Paris 1911. **665**

France

Market gardening and fruit growing in France have become to-day an important branch of agriculture; it is a good many years ago that their produce ceased to be limited by local consumption, and entered the domain of international trade.

The market garden produce of Algeria, such as grapes, early potatoes, tomatoes, haricot beans, and artichokes are exported to very considerable distances; and the same is done with the strawberries of Plougastel, of Hyères and of Carpentras, with the melons of Cavaillon, the cherries of the Var, Roussillon, and Ardèche districts and of Montaubau, the peaches of the south of France and of the Rhone valley, the Chasselas grapes of Fontainebleau and of the Garonne valley, the plums of Algenais, the artichokes of Hyères and of Roscoff, the green peas of Brive, the cauliflowers of Roscoff and Angers, and the flowers of the Var and of the Alpes Maritimes departments.

At first all this produce flowed to Paris. The central markets of Paris became a market not only for the inhabitants of that city, but also for the great neighbouring centres of population which constantly increased the amounts of their purchases in the Paris markets, until the modifications in the railway tariffs and the competition among the middlemen facilitated the direct exportation from the producing to the consuming centres.

The railway tariff modifications consisted at first in the introduction, in 1881, of the 3 kilogram (6.6 lb.) parcel post, at a uniform rate for the whole of France. In July 1892 the weight allowed per parcel was increased from 3 to 5 kilos (11 lb.). In September 1907 to 10 kilos (22 lb.) and in November 1911 to 40 kilograms (88 lb.).

Without doubt the bulk of the tonnage is still handled by the wholesale trade, but a great number of consumers are supplied directly by means of the parcel post.

But this is not all. Formerly almost all the special tariffs for carriage by fast goods trains contemplated Paris as their only terminus. Now, the railway companies have extended the special tariffs to the various stations of their lines, which may forward goods directly to each other at reduced rates.

The following table gives the tariffs for the carriage of fruit and vegetables, by fast trains, in 1880, 1890 and 1905 from certain stations to Paris and to Boulogne.

Tariff for the carriage of fresh fruit sent by the P. L. M. Ry. Freight per ton, without limit as to quantity, extras included, from the following stations to Paris.

1. Inland Tariff.

Stations	Distance Miles	Freight 1880			Freight 1890			Freight 1900			Difference in Freight Between 1880 and 1890				Difference in Freight Between 1880 and 1900			
		£	*s*	*d*	*£*	*s*	*d*	*£*	*s*	*d*	*£*	*s*	*d*	%	*£*	*s*	*d*	%
Hyères	568.49	11	9	2.5	9	12	4.6	5	17	2.7	1	16	9.9	16 —	5	11	9.9	48.79
Marseille Joliette	514.44	10	8	8.3	8	19	5 8	5	15	7.6	1	9	6.5	14.03	4	13	0.7	44.96
Avignon	448.58	9	2	9.4	7	18	11.6	5	11	11.8	1	3	9.7	13.03	3	10	9.5	38.73
Lyon-Brotteaux .	303.82	6	8	2.5	4	13	9.2	4	8	2.1		14	2.0	11.06	2	0	6.7	31.68

2. From following stations to Boulogne, Export Tariff.

Hyères	732.51	14	16	6.1	12	19	8 2	8	3	2.6	1	16	9.9	12.42	6	13	3.6	44.95
Marseille Joliette	677.84	13	15	13.9	12	6	9.4	8	1	5.6	1	9	6.5	10.58	5	14	6.3	41.49
Avignon	661.98	12	10	11.3	11	6	3.3	7	17	9.8	1	3	9.7	9.52	6	12	8.4	36.86
Lyon-Brotteaux .	467.84	9	15	2.9	9	1	1.8	6	13	3.6		14	2.0	7.25	3	2	0.3	31.75

Tariff for the carriage of fresh vegetables sent by the P. L. M. Ry. to Paris.

Freight per ton.

											£	*s*	*d*					
Hyères	568.49	7	10	10.5	7	7	9.83	5	10	10 0	– »	3	0.7	2.02	2	0	0.5	26.54
Avignon	448.58	5	17	5.5	6	0	3.34	4	11	1.4	+ »	2	5.05	2.05	1	5	11	21.98

to Boulogne sur Mer :

Hyères	732.51	10	18	2.1	10	15	1.45	7	12	10.8	— »	3	0.7	1.40	3	5	3.4	29.92
Avignon	611.98	9	5	1.9	9	7	9.82	6	14	1.1	+ »	2	5.1	1.31	2	11	1.2	27.63

The P. L. M. in 1902 lowered its tariffs for vegetables; it made in 1905 special tariffs for table grapes in parcels of 50 kg. (110 lb.) and in 1907 a seasonal tariff for artichokes, cabbages, cauliflowers, haricot beans, green peas and salads.

Lastly, in 1906-1907 exceptionally low export freight tariffs were introduced: according to which from Hyères to Boulogne-sur-Mer (special tariff for England) a ton of fruit in 50 kg. (110 lb.) parcels pays for 1 179 kilometres (732 miles) 130.45 fr. (£5.3*s* 6 ½*d*) and a ton of vegetables 121.45 (£4.16*s* 4 ³/₄ *d*).

Exportation to West Germany has been especially favoured: a ton of fruit from Hyères to Jeumont 1 066 kilometres (662 miles) pays 115.80 fr. (£4.11*s*. 10*d*) and a ton of fresh vegetables 99.80 fr. (£3.19*s* 2 ½ *d*).

Besides lowering the tariffs, the railway companies have much improved the carriage of fruit and vegetables by considerably reducing the duration of the journeys. Generally, provision trains employ 22 to 24 hours on the 863 kilomet. (536 miles), run from Marseille to Paris and 18 to 20 hours from Avignon to Paris (460 miles).

During the season, garden produce from Avignon reaches its destination within the following time:

Londo 38 hours.
Frankfurt-on-the-Main 33 hours.
Hannover 60 hours.
Berlin 61 »
Hamburg 65 »
Bremen 66 »

This rapidity of transport has especially facilitated the exportation of the more perishable kinds of fruit and vegetables.

The rolling stock used for the carriage of these commodities has also been much improved — at first special vans were built, in which ventilation was provided for by moveable shutters, resembling Venetian blinds, in the upper parts of the sides. Later railway vans were built with double sides enclosing a non-conducting air space between them. Lastly, the outsides of some are painted white, so as to diminish the absorption of heat, and others are fitted with interior passages so as to enable the company's agents, while travelling, to classify the parcels according to their destination.

The markets for the sale of fruit and vegetables increase in numbers and importance every year. Besides Paris, there are now the great markets of England and Germany and the important centres of consumption in France itself.

Thus in 1908 the P. L. M. Ry. lines carried 26 000 tons of fruit and 15 600 tons of vegetables addressed to various destinations in Switzerland, Germany, England and Belgium, and 36 100 tons of fruit and 36 600 tons of vegetables to Paris and other French centres beyond Paris.

As for the flowers gathered on the coast of the Mediterranean 5 333 tons were sent abroad, and 4 595 tons to Paris and to French centres beyond Paris.

The principal points to which the attention of all those interested in the fruit trade should be drawn, may be summarized as follows :

To produce specially for exportation, and to establish a commercial brand by the honesty and excellence of the goods exported.

To export to each country only those products which meet the requirements of local customers.

In this respect agricultural associations might do very useful work in supplying the producers of the various regions with the necessary information ; they might also, together with the professors of agriculture, carry on a most useful propaganda for the systematic control of garden and orchard pests.

It is also highly important to develop the cold storage industry in the chief centres of production, and as it is proven that only absolutely sound fruit can be kept in cold storage, one can foresee that agricultural cold stores will have to be provided with an annex for the preparation of preserves, where over-ripe fruit may be dried or converted into jams, jellies etc.

Since the railway companies set the example, followed by agricultural associations, of organizing shows of packing materials, a real packing industry has arisen in France.

Many railway companies carry returned empties free of charge ; it would be in their interest as well as in the producers', if goods transported in unreturnable packing paid a lower tariff than those in returnable packing.

666 REBHOLZ, K. **Promotion of Cultivation of Vegetables.** (Förderung Gemüsebaus). — *Landwirtschaftliches Jahrbuch für Bayern*, 2. Jahrg., No. 1, pp. 1-13. München, 1912.

Germany: Bavaria

During the last ten years there has been a great development in Bavarian fruit cultivation, thanks to the Government and various organisations ; but no similar advance in market garden produce can be recorded The latter ought to be developed by the same methods as those which have been applied to the fruit industry.

At present it is suffering from the want of all technical and commercial organisation, and especially of model gardens.

Vegetables are cultivated everywhere in Bavaria, and especially in Franconia, in the Palatinate, and in the South of the Upper Palatinate.

In the Bamberg district in Upper Franconia about 11 500 tons of vegetables are produced yearly. In Lower Franconia and specially at Würzburg 1345 acres are reserved for vegetables, and most of them are under glass. In Central Franconia Nürnberg is the centre of this industry, which is worth £46 000 annually. The yearly production in the Lower Palatinate is estimated at about £51 250 and consists chiefly of new potatoes, cucumbers, onions, asparagus, and radishes.

Also in the Upper Palatinate a considerable amount of vegetables is grown. The radishes grown in the neighbourhood of Regensburg are celebrated, and are sent to all parts of Germany and abroad. The production of Swabia is chiefly in the neighbourhood of Augsburg.

In 1907 the area under vegetable cultivation in Bavaria was as follows:

	Acres
Upper Bavaria	10 480
Lower Bavaria	17 922
Palatinate	6 847
Upper Palatinate	25 587
Upper Franconia	14 291
Central »	13 355
Lower »	13 123
Swabia	7 353
Total	108 958

Between 1900 and 1907 the area under vegetable cultivation diminished by 41 503 acres, or 21.9 per cent.

Every year Germany pays for the importation of vegetables some £2 000 000; so that this branch of German agricultural production ought to be promoted by every possible means. If we reckon that each hectare yields every year 150 qls. (each acre, 6 tons) of produce, it will be found that Bavaria produces every year about 6 616 950 qls. (650 000 tons).

The average annual consumption of vegetables in the whole of Germany is 83.6 lbs. per head. In Bavaria it is much less; but it would be larger, and the inhabitants would have more healthy food, if more attention were paid to this industry.

First and foremost the cultivation of small kitchen gardens for the use of families should be improved and encouraged.

From the commercial point of view, it may be said without hesitation that the improvement of this industry is possible, indeed necessary, everywhere, while its extension is only to be recommended where climate and surroundings are favourable. In this connection we should remember the importance of internal colonisation and of turning to account heaths and peat bogs. Experiments in planting, in cultivation, and in manuring should be set on foot; associations should be formed for the sale of vegetables, and for the purchase of manures and materials for packing.

There is no lack of agricultural schools in Germany, but they ought to be more attended by market gardeners. Above all, market gardeners should form associations, and the long talked of model fruit and vegetable garden should be established, so that the fruit and vegetable industries may run on parallel lines.

667 DE NOTER, R. **The "Gobô" or Salsify of Japan (*Lappa edulis major*)** (1). (Le « Gobô » ou Salsifis du Japon). — *Le Jardin*, XXVI Année, No. 600, pp. 55-56 (1 fig.). Paris, 20 Février 1912.

France. Scotland. Japan

The "Gobô" is regarded, not as a species, but as a variety of *Lappa edulis* (*Lappa major*), a plant which is found also, under the name of "Bardane", in France, where, according to Duchesne, in different districts it is called by different names, viz., "bouillon noir", "grippe", "gloutteron", "collant", etc. It seems that in Scotland the roots and young shoots of the European *Lappa edulis* are eaten by the poor, but the Japanese variety is much choicer, great attention being paid to its cultivation.

In France M. de Noter has experimented with this plant for some years, with very satisfactory results, especially as regards the weight. In 1910 he exhibited at Cours-la-Reine a bunch of "gobô"; 30 roots weighed 28.6 lbs., and a good many of them weighed separately as much as 14 oz.

After four months at most, its roots are 15 to 18 in. long, so that it can obtain sufficient nourishment without exhausting the soil; it withstands cold and drought; it is sown between 15th June and 15th July, which allows a catch crop to be made of it; its growth is rapid, and if only regarded as a forage plant, its value is very great.

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(1) *Lappa edulis* = *Lappa major* = *Arctium majus*, the common burdock. Cf. *Index Kewensis*. *Ed.*).

Cultivation. The soil must be very deep and light, to prevent the roots fanging. The surface must be covered with a good layer of comparatively fresh manure. After this is worked in with spade or plough, the soil is levelled with a rake or harrow. Furrows are then traced 1 ft. 7 in. apart, in which the seed is scattered so as to form little heaps every 10 or 12 inches along the rows. The soil must be kept moist, so that the germination may proceed regularly. Watering must be increased as the plants become stronger. In November the Salsifies may be collected either entirely or partly ; in the latter case they are placed in a trench till required and covered with earth and some straw on the top to protect against frost. The stems and leaves may be given to rabbits and other animals which eat them readily.

" Gobô " is prepared for the table like salsify and scorzonera (viper's grass). In order to make its slightly coarse flavour entirely disappear, it should be cooked twice in different water.

FRUIT-GROWING.

ZUCCARELLO, A. **Experiments on Forcing Grafts on American Vine Stocks by Means of the Heat of the Sun.** (Esperienze sulla forzatura con il calore solare degli innesti su viti americane). *L'Agricoltura italiana.* Pisa, 16 Febbraio 1912. **668**

Italy

The author, whilst engaged as director of an establishment for forcing grafts on American stocks, was enabled to carry out experiments on forcing in which he utilized the heat of the sun instead of the artificial heat generally used in such establishments. Four brick-work forcing frames were built along the south eastern wall of the establishment.

The first frame was completely filled with grafts that had not been tied. They were placed at an inclination of 60°, in alternate layers with washed sea-weed, and covered with 3 to 4 inches of the same sea-weed up to within 6 inches from the glass light.

Frame No. 2 was filled like No. 1, only moist sand was used instead of sea-weed and the grafts were tied with two strands of raphia; these also were covered with a glass light.

In Frame No. 3 the tied grafts were gathered in bundles of 25 each. They were stratified horizontally in moist sand, almost up to the edge of the frame.

Results of experiments made in the year 1909 on the forcing of American vines, utilizing the heat of the sun.

No. of Frame	Date on which the frame was filled	Number of grafts	Variety of Stock	No of grafts per stock	Variety of scion	No of grafts per scion	Date of binding	Date of appearance of roots.	Date of appearance of shoots	Length of shoots when planted, in inches.	Date of planting out	Percentage of successful grafts.	Percentage of successful grafts with shoots.	Percentage of grafts with roots.	No. of grafts planted out
1	March 17	2 000	Riparia × Rupestris 3309	2 000	Livese	1 000	March 29	April 4	April 1	1 2-2	April 17	82.00	74.00	13.25	820
					Bianco Alessano	1 000	March 27		March 30	1 2-2 75		84.00	77.00	13.25	840
2	March 19	2 000	Aramon × Rupestris	1 000	Primitivo	2 000	March 30	—	March 27	1 6-4	April 17	79.00	72.00	—	790
			Riparia Gloire	1 000			April 1	—				78.00	68.00	—	780
3	March 22	2 000	Aramon × Rupestris	1 500	Lombigna	2 000	April 10	—	April 5	0-2	April 24	65.00	21.00	—	975
			Riparia Gloire	500			April 14	—				63.00	17.25	—	315
4	March 24	2 000	Riparia × Rupestris 3309	2 000	Livese	1 000	April 6	—	April 2	1 2-3.2	24 Avril	76.25	64.00	—	762
					Bianco Alessano	1 000	April 4	—				77.37	68.29	—	713
														Total . . .	5 995

Frame No. 4 was filled exactly as No. 2. only it was not covered with glass. Every evening at sunset sacks containing coarse stable manure were placed over the lights of frames 1 and 2 and kept there till the next morning, thus preventing the dispersion of the heat absorbed during the day.

The table on page 950 shows the results of the experiment.

As regards the regular development of the two parts of the graft, frame No. 1 answered best.

In the frames in which sand was used, the development of the shoots was much hastened, and the production of the wound callus of the scion was rather rapid, whilst the stock proceeded very slowly.

The distribution of the temperature in the various layers in the sand-filled frames, especially in No. 2, was much less regular than in No. 1.

In the grafts placed horizontally the callus binding the graft and scion appeared much later and imperfectly. They gave the least satisfactory results.

In order to maintain, in the frames, the necessary degree of moisture, every three or four days the layer covering the grafts was sprayed with water at the same temperature as the covering. The glass lights only hastened still more the too rapid vegetation of the scions, without benefiting in any way the final result of the operation.

On the other hand it appeared that covering the frames during the night and cold days with thick matting or with sacks containing coarse stable manure, was very useful.

The author carefully collected all the data respecting the expenses from the beginning of operations up to the time when the successful grafts were planted in the nursery. From the above it is seen that the number of grafts forced by the heat of the sun was 8 000, of which 5 995 were planted in the nursery. The total expense amounted to £11.2*s*. 11*d*, and the cost of the grafts planted in the nursery was 3s 8 $^3/_4$ *d* per hundred, which is not a low price, especially considering that among these there were a good many that did not look very promising.

HIGGINS, J. E., HUNN, CHESTER J. and HOLT, VALENTINE S. **The Avocado in Hawaii.** — *Hawaii Agric. Exp. Station, Bulletin* No. 25, pp. 1-48. Washington, Dec. 1911. **669**

Hawaii The avocado is a member of the family Lauraceae and is designated botanically as *Persea gratissima*. It bears many common names, such as midshipman's butter, butter pear, vegetable marrow, palta, aguacate, alligator pear etc. It is indigenous in tropical America from Mexico to Peru. It is a tree 22 to 65 ft. high, which thrives without requiring the intense heat that is demanded by many torrid zone plants.

Four species of *Persea* have been introduced into the United States, especially in Florida and in California (1).

These are *Persea Lingue*, *P. pumila* (2), *P. indica* and *P. Meyeniana*. In India the cultivation of the avocado does not extend. In Java good avocados are rare; in the Philippines the plant does not thrive. In Hawaii where the species is successfully grown from sea level to about 700 or 800 feet elevation it was introduced in the early fifties.

The avocado may be propagated by seeds, by budding or by grafting by cuttings. In Hawaii the soil is prepared for planting an avocado orchard by thorough ploughing and harrowing. Cover crops must be planted during the wet season in practically all parts of Hawaii.

The plants used for this purpose may be any one of a number of legumes, such as cowpeas, jack beans, Mauritius, lablab or soy beans. Pigeon peas (*Cajanus indicus*) are often used as windbreaks for nursery stock. As permanent windbreaks *Eucalyptus robusta* has been found very useful.

The insect pests of the avocado are fortunately few in number, but one, the avocado mealy bug (*Pseudococcus nipae*) is very troublesome. Wood-boring beetles of the genus *Xyleborus* are frequently found injuring avocado trees; of these three species are recorded. A caterpillar (larva of *Amorbia emigratella*) has also recently been doing considerable injury.

Among the enemies of the avocado a parasitic fungus of the genus *Gloeosporium* is prevalent throughout the Hawaiian Islands and gives rise to a disease which may be called rusty blight. It is apparent chiefly on the foliage and young branches.

Analyses made at the Maine and Florida experiment stations give the following composition of the edible portion of the avocado:

	Water	Protein	Fat	Carbohydrates Nitrogen-free extract	Carbohydrates Crude fibre	Ash
	%	%	%	%	%	%
Maine	81.1	1 —	10.2	6.8		0.9
Florida	72.8	2.2	17.2	4.4	1.9	1.4

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(1) See *B.* Aug.-Sept.-Oct. 1911, No. 2678.

(2) This species is not mentioned in the *Index Kewensis*. (*Ed.*).

Hitherto but few attempts appear to have been made for the preservation of avocados. In one successful sterilization and bottling of the fruit, these were sterilised at 150 to 156° F. for four hours, the water being sterilized the previous day at 150° F. for one hour.

The Hawaii Exp. Station made a considerable number of experiments in the marketing of avocados. Fruits were placed in Vancouver, in Chicago, New York and Washington D. C. Some varieties arrived in good condition. It seems probable that with suitable shipping facilities and a careful selection of varieties the avocado can be successfully shipped to far distant markets.

The following are some of the best trade varieties:

Chappelow. It is productive, but being an early bloomer it is sometimes caught by frost.

Pollock, moderate grower, heavy bearer.

Trapp, fairly vigorous and very productive; it ripens late, which renders it remarkable for the winter trade when very high prices are realized. A large proportion of the budded trees thus far planted in Florida consists of this sort.

The Hawaii Exp. Station has under observation many of the Hawaiian varieties, of which about 65 have been described in detail by C. J. Hunn.

The following varieties of special merit are described or mentioned: No. 149, Moanalana, Nos. 150, 145, 105, 106, 108, 111, 121, 141, 142, 143, 151, 156, 157, 158, and 224.

DE GIRONCOURT, G. **The Palmyra Palm and the Value of its Nuts.** (Le Rônier et la valeur de ses noix). — *La Geographie*, No. 1, pp. 50-52. Paris, 15 Janvier 1912. **670**

French W. Africa

Borassus flabelliformis, called the fan or Palmyra palm furnishes excellent wood in the districts of the Sudan bordering upon the zone of Upper Senegal and the Niger, which is destitute of trees with large trunks. In this district, so many of these trees have been cut down, as to cause anxiety lest the species should be exterminated. Recently, the nuts of this palm have been proved to be of industrial value.

The natives only use the pericarp of the fruit, the edible portion, which is very small and of little worth. The kernels are only eaten in the case of young fruits when they are watery or gelatinous.

On ripening, they become compact, hard, and impermeable to the mordants employed in dyeing; this, together with their light colour, has given rise to the idea of using them as a substitute for "corosos nuts" (1). But their dirty yellow tint detracts from their value. These kernels have recently been offered in Hamburg for sale at 400 frs. (about £16) per ton. Calculating that from the several bunches of 50 kg. (110 lbs.) produced annually by a tree, about 80 kg. (176 lbs.) are fine fruit of which the third part in weight can be turned to account, it will easily be seen that the Palmyra palm is of great value in French West Africa.

Each of the round fruits contains from one to three kernels; those with only one occur im the proportion of 5 per cent, while those with two, which are much the best, form from 60 to 70 per cent of the whole.

The average weight of the dry kernels is 125 grammes (4 ½ oz.). The Government of the Colony has already granted two concessions for the collecting of these nuts, which constitute a product of the greatest interest, as a new source of income for French West Africa.

FORESTRY.

671 Felling Trees and Blowing Stumps with Dynamite.

Blowing Stumps with Dynamite. — *Kentucky Agricultural Experiment Station of the State University; Bull.* No. 154, pp. 19-31. Lexington, Ky., 1911.

A. T. ANDERSON. Recent Developments in Explosives. — *The Engineering and Mining Journal,* Vol. 93, No. 5, pp. 270-273. New York, February 3, 1912.

J. T. GARRETT. Dynamite for preparing Land. — *Experiment Station Record,* Vol. XXV, No. 9, p 890. Washington, January 10, 1912.

United States In the felling of trees or the removal of tree stumps a great deal of labour can be saved by the use of various explosives, and especially of dynamite.

Tree felling. — Trees may be felled, either by girdling them with an outer charge or by causing an explosion in their centre.

In the first case a hollow cord filled with dynamite is placed round the tree and kept in position by nails, or other means, and is fired by a fuse and cap; the tree is felled by a charge C of dynamite given by the following formula

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(1) "Vegetable ivory": see *B.* Aug.-Sept.-Oct. 1911, No. 2714. (*Ed.*).

$$C = 0.00069 \times a^3 \ (1)$$

where C represents the weight in pounds and a the diameter of the tree in inches.

In the second case a horizontal hole in the trunk is made with an auger; in it a dynamite cartridge furnished with fuse and cap is placed and then carefully tamped. The charge C' of dynamite is given by the following formula:

$$C' = 0.000103 \ a^3 \ (2)$$

in which C' and a represent pounds and inches respectively as in formula (1).

Blowing of stumps. — The hole is bored with a wood auger at an angle of about 45 degrees, so that the charge will come under the center of the stump. The diameter of the hole is 1.6 to 2 inches. The charge is placed at the bottom of the hole, the primer put in, and carefully tamped.

If the stumps are partially decayed, of course the charge will have to be located under some firm part of the stump.

In blowing very large stumps, the whole charge should not be placed in one hole, but several holes may be bored from different sides and made to intersect under the centre of the stump. The primer is placed at the intersection of the holes and the other cartridges put in so as to touch the primer.

Only a part of the charge necessary to remove a large stump may be used at first to split it. After the stump is split the parts may be blown as separate stumps.

The amount of dynamite to be used depends on the diameter of the stump; the nature of the root system; whether the stump is green or partly decayed, and the character of the soil.

In Kentucky, two different lots of stumps were blown by the Experiment Station in the spring of 1911. One lot consisted of 102 stumps, mostly of dead oak. The other lot comprised 16 stumps, 9 of which were green (3 hackberries, 1 elm, 1 cherry, 1 maple and 3 oak).

The following are the figures concerning the first lot.

Average diameter of stumps	16 inches
Total weight of dynamite required	132 lb.
Time required for one man	51 hours
Cost of dynamite.	$ 22.85
Caps and fuse	$ 2.35
Cost of labor, 5 days at $ 1.50	$ 7.50
Total cost of blowing 102 stumps.	$ 33.70
Average cost per stump . . . . , .	$ 0.33

The figures of the nine green stumps of the second lot are the following:

Average diameter.	22 inches
Total weight of dynamite required	48 lb.
Time required by two men	18½ hours
Total cost of blowing stumps	$ 14.06
Average cost per stump	$ 1.56

The diameters of the three green oak stumps measured 45, 48 and 43 in. respectively. The cost of blowing these stumps was:

Dynamite, caps and fuse	$ 6.70
Labour	$ 3.85
Total cost $ 10.55, or average per stump . .	$ 3.52

The amount of dynamite required to blow stumps of the same kind in the same soil does not vary directly with the diameter, but more nearly with the square of the diameter, or in other words with the area of a cross section of the stump. The cost of blowing green stumps is from two and a half to three times as great as for dead ones.

672 CLERGET, PIERRE. **Krumyria and its Forests.** (La Krumyrie et ses forêts). — *La Géographie*, No. 1, pp. 47-50. Paris, 15 Janvier 1910.

Tunis

Krumyria is one of the most distinctly defined of the natural region of Tunis; from east to west, it extends from the country of the Mogod to the Algerian frontier which, geographically, it crosses; from north to south, it stretches from the sea to the valley of the Medjerda. Wherever the forests have disappeared, erosion has worn away the superficial rocks and has given rise to dunes. Owing to its relief and its vegetation, Krumyria belongs to the most rainy district of Tunis, that which has an annual rainfall of more than 600 mm. (23.6 inches). Owing to the abundant rain, the forests of cork-oak and of evergreen oak are magnificent. They extend over an area of 100 000 to 120 000 hectares (247 000 to 296 400 acres) and, like all the forests of Tunis are the property of the State.

The cork-oak does not grow at an altitude above 1300 m. (4264 ft), 600 to 800 m. (1 968 to 2 724 ft.) being the most favourable. The first crop of cork (virgin cork) has little elasticity and is of less value than the subsequent crops, which grow again every ten to twelve years; the virgin cork is removed when the tree reaches the age of 20 to 30 years.

The evergreen-oak only covers an area of from 8 000 to 10 000 hectares (19 760 to 24 700 acres) it is still more difficult to grow and more of a calcifuge than is the cork-oak. It especially seeks a north exposure, and is found chiefly at the bottom of valleys where the soil is deep and moist. Trees worth cutting are becoming rare.

The natives are chiefly live-stock breeders and foresters; they keep principally cattle and goats, sheep being rare.

The native cereal most grown is sorghum.

The coast is sparsely inhabited, as is also the northern slope. It is necessary to reach the district of Béja and of Souk-el-Arba, in order to see numerous farms devoted to cattle-raising and cereal-growing.

The plain of Dakla which is crossed by three streams, the Medjerda, the Melleg and the Tessa includes some of the richest soil in Tunis.

LIVE-STOCK AND BREEDING

HYGIENE.

673 **The Causation of Molteno, Picton or Winton Disease in Cattle and Horses.** — *Bulletin of the Imperial Institute.* Vol. IX, No. 4, pp. 346-351. London, 1911.

Union of S. Africa. Canada. New Zealand

This disease has affected horses and cattle for some years in the Union of S. Africa, Canada and New Zealand, inducing hepatic cirrhosis. The symptoms of the disease in the three localities is practically identical. Cattle are observed to be "unthrifty" for some time, diarrhoea often sets in and death follows in from two to four days after the first definite symptoms are observed.

It has been proved that the disease is caused by species of *Senecio*, *S. latifolius* and *S. Jacoboea*, the toxic action being due to the alkaloids in these plants.

The best remedies are:

1. Shorter rotation of crops.
2. More thorough cultivation.
3. Cutting the species of *Senecio* before the seed forms.
4. Grazing sheep on land infested with these plants.

674 Good, Edwin S. and Bryant, Thomson R. **The Dipping of Sheep for Scabies in Tobacco Dips with and without the Addition of Flowers of Sulphur.** — *Kentucky Agricultural Experiment Station: Bull.* No. 157. Lexington, Kentucky, Sept. 1911.

United States: Kentucky

This bulletin describes an experiment which was carried out in order to determine whether or not it is necessary to use sulphur with tobacco dips in the dipping of scabby sheep, for the destruction of the scab mite.

Thirty scabby sheep were taken and carefully separated into six groups of equal size, and placed in isolated pens, with every precaution to prevent exchange of infection.

The first dipping took place on March 31st, 1910. Three groups were dipped in 0.07 % nicotine, no sulphur being used; and two groups in 0.05 % nicotine, without sulphur. One group was kept as control.

Before dipping all the hard scabs were hand dressed, being moistened with the dip which was to be used, and rubbed with corn cobs to help in softening. The sheep were submerged for two minutes, the head being ducked once on entering the vat, and again just before leaving it.

The water temperature was 105° Fahr.

On the following April 11, the sheep were re-dipped, three groups in 0.05 % nicotine, without sulphur; and two groups in 0.05 % nicotine, *plus* resublimed flowers of sulphur, at the rate of 2 % by weight of the diluted dip. The last group was kept as control, as before.

The animals were examined on May 11, and June 10, 1910, and it was found that no sheep in any of the groups — except the control — bore any mites or indications of scabies.

The conclusion is that the addition of flowers of sulphur adds nothing to the efficacy of the remedy, and the Bureau of Animal Industry after further experiments under field conditions has made a ruling, withdrawing the requirement that sulphur be added to tobacco dips, and fixing the amount of nicotine at 0.07 %.

HUTYRA, DR. F. **Experiments on Immunisation of Swine against Plague**. (A sortéspestis elleni védôojtások kisérleti alapja). — *Köztelek*. No. 18. Budapest, March 2, 1912. **675**

Hungary

The author, director of the high veterinary school of Budapest conducted some time ago several experiments to test the efficacy of vaccinating pigs with the anti-plague serum, and proved that it renders them completely immune against plague and against artificial inoculation of the same. A notice of these experiments was published in No. 35 of the *Köztelek*, 1909; since then they have been repeated with the object of proving that the preventive action of the serum produced, according to the improved method hitherto followed, is always and invariably satisfactory.

Following these numerous experiments carried out with the cooperation of Dr. Köves, the author publishes the results of another series of tests confirming the good results of the serum, which is already used in practice.

These experiments were made on 64 young pigs, 5 to 8 months old of the Hungarian *mangalicza* breed, all of them raised on the same farm; and weighing on an average 23 kg. (50 lb.) each. On their arrival they were placed in highly infected sties, in which they remained until the end of the test, the chief object of which was to try four varieties of serum produced in the laboratory at different dates and from various breeds of pigs; but in the main the same method was followed, namely, repeated treatments with virus taken from infected pigs. Another object of these experiments was to ascertain whether the serum of pigs which had survived the infection, but which had not been afterwards artificially rendered immune, possessed immunising properties.

The results are summarised in the following table.

	METHOD OF TREATMENT (The animals were also exposed to natural infection)	Number of animals	Died of plague	
			head	%
1	8 cc. serum A + 2 cc. virus (hyp. injec.) . .	8		
2	8 cc. » B + 2 cc. » »	8		
3	8 cc. » C + 2.8 cc. » »	8		
4	8 cc. » D + 2 cc. » »	8	1	12.5
	Total . . .	32	1	3.1
	Control			
5	Untreated	8	6	75
6	2 cc. virus (hypodermic injection)	8	6	75
7	8 cc. normal serum + 2 cc. virus (hyp. injec.) .	8	7	87.5
		24	19	79.2
8	8 cc. serum from pigs that had survived the infection + 2 cc. virus (hyp. injec.)	8	4	50
	Total . . .	32	23	71.9

Inoculations were made on January 7th, 1910 and the infected pigs died between January 15 and March 3. The surviving animals remained in the sties till June 20, when they were sold and fattened, attaining at the end of March, 1911 the weight of 80 to 100 kilos (176 to 220 lb.) each. There can be no doubt as to the efficacy of the serum, considering that of the 32 pigs that were inoculated only one died, and this notwithstanding the simultaneous natural and artificial infection, whilst in the same time most of the 32 pigs of the control lot died of the plague.

BOUTAN, L. **The Buffalo Bird.** (Le Merle Buffle). — *Bulletin de la Soc. d'Etudes et Vulgarisation de la Zoologie agricole*, 10e année, N. 1, pp. 1-17. Bordeaux, Février 1912. 676

France

The author gives a description of the Buffalo Bird (*Acridotheres cristatellus*) which is found in fairly large numbers in Southern Asia. This bird both in its general aspect and in plumage resembles the Blackbird (*Turdus merula* L.) though it belongs to the family of Sturnidae. It lives in the neigbourhood of and in villages. It feeds on insects which it seeks on the backs of animals, chiefly of buffaloes and other cattle, which are so accustomed to the birds that they do not attempt to drive them away.

The Buffalo Bird is met with throughout Southern Asia, under such various conditions that the author believes that it could be acclimatized in the South of Europe. He advocates its introduction as a means of controlling the parasites of our cattle, especially ox-flies.

WORK OF LIVE - STOCK ASSOCIATIONS AND OTHERS FOR ENCOURAGEMENT OF BREEDING.

Special Railway Regulations in Germany for the Transport of Cattle in Summer. (Besondere Massnahmen der Königlichen Eisenbahnverwaltung bei Viehsendungen im Sommer). — *Zentralblatt der Preussischen Landwirtschaftskammern*, Jahrg. 11, Nr. 9, p. 61. Berlin, 26 Februar 1912. 677

Germany: Prussia

The hot summer of 1911 often had a bad effect on the cattle carried by railway, especially when the distance was long. To prevent this in future, the Prussian Railway Administration has issued a regulation to the effect that during the hot season the carriage of cattle is to be as rapid as possible, and that if a delay should occur through no fault of the sender or of the attendant, the cattle cars will be despatched to their destination by trains set apart for them, without any increase of charge. The cattle are not to be packed too closely together.

Water and suitable apparatus are to be kept ready at the stations for sprinkling the cattle and the cars.

On the demand of the sender, open-work trucks, will be provided as far as possible for pigs. Long distance journeys should be effected in the night.

678 **Government Subsidies for Bulls and Boars.** (Kundmachung betreffend die Abgabe von Subventionsstieren und-Ebern). — *Landwirtschaftliche Mitteilungen für Steiermark.* 61. Jahrg. No. 5, p. 69. Graz, 1. März, 1912.

Austria

The Kaiserlich Königlich Landwirtschafts-Gesellschaft in Steiermark provide cattle for breeding in districts where no associations for this purpose exist, on receipt of a proper application. The bulls are bought by the Society where they were bred, and consigned to applicants on payment of 60 % of the price. After two years they become the property of the recipient. If the animals are not properly fed and kept, he has to pay the remaining 40 % of the price.

From its breeding stations the Society also supplies boars to its members on payment of 30 Kronen or £1 5*s*. The recipients undertake to make an entry in the register of all couplings and also to place the boars at the disposal of other owners of sows at a charge of not more than 50 heller, or 5*d*. After two years the boar become the property of the recipient.

The Society also provides on the same conditions rams of the Carinthian Zealand race on payment of 20 Kronen (16*s*).

HORSES.

679 MÜLLER. DR. MAX. **Researches upon the Functional Adaptations, and Anatomic and Physiological Differences between Light and Heavy Breeds of Horses.** (Studien über funktionelle Anpassung und über anatomische und physiologische Unterschiede zwichen warm und kaltblütigen Pferden). — *Arbeiten der Deutschen Landwirtschafts-Gesellschaft.* Heft 189, Berlin 1911.

Germany

In the first part of his work, the writer investigates the difference between light and heavy horses (Warm- und Kaltblütern) in regard to their lungs, heart, liver, pancreas, the amount of blood they possess, and the haemoglobin content of the latter.

The necessary investigations were carried out in the Berlin Central Slaughter House for horses, upon 48 horses of either type.

The second part of the work consists of measurements for the purpose of ascertaining the length and angles of the fore and hind legs; 49 trotting horses were investigated from the Ruhleben stud, 25 pure-bred horses from the Royal Stables at Berlin, 18 heavy dray-horses and 10 heavy horse stallions. The hind leg measurements were made in the case of the above 49 trotting horses, 51 post horses (Postpferden) and 48 heavy brewery dray-horses.

In the lung-investigations freshly killed horses were used. Weight and air capacity were measured by means of inflating the lungs to a determined manometer pressure. The average lung-weight of a light horse was 4.45 kg (limit 3.40 — 6.45 kg) and the average air capacity was 38.2 litres (limit 28.9 — 54.7). The lungs of the heavy horse had an average weight of 6.3 kg (4.55 — 7.50 kg and an average capacity of 41.5 litres (30.2 — 56.6 litres). The light horse had a lung capacity of 8.87 litres per 100 kg of live weight, the heavy horse only a lung capacity of 6.59 litres. 1 kg of lung weight represented an air capacity of 8.64 litres in the case of the light horse and 6.67 litres, in that of the heavy horse, thus we must conclude that the lungs of the light horse which have a 22.8 % larger capacity than those of the heavy breed must possess a finer texture. It is noticeable that the lung capacity of the light mare per kg of lung weight is 7 % greater than in the case of the gelding of the same breed. The exterior chest measurement gives no indication of the lung-weight. The heart was tested by the Bohr method (1), which gave the volume of actual heart muscle at 3.20 litres in the case of the light horse, and 4.10 litres for the heavy horse. The absolute maximum heart capacity in the case of the 26 light horses investigated was 3.95 litres (2) (3.20 — 5.0 litres). The average for 36 heavy horses was 4.77 litres (3.2 — 6 litres).

The heavy horses had thus, on the whole, the greater heart capacity. If, however the heart capacity is reckoned by 1 kg of heart weight, it is found that light horses have an average heart capacity of 1.18 litres, (0.90 — 1.44 litres) and heavy horses only

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(1) BOHR, *Skand. Archiv. f. Physiologie*. Bd. 22. 1909. S. 221.

(2) Owing to the pericardium being injured during dissection, not all the hearts could be examined.

1.09 litres (0.84 — 1.39 litres) per 1 kg of heart weight. When reckoned per 100 kg live weight, the heart capacity of all heavy horses was below 1 litre, being on an average 0.78 litres, while 22 of the 26 light horses tested had a heart capacity of at least 1 litre per 100 kg of live weight; on average the heart capacity was of 0.93 litres. It thus follows that heavy horses have a greater relative capacity, but a smaller heart capacity than is possessed by light horses.

If the maximum heart capacity per live weight is taken as 100 for the light horses investigated, that of the heavy horses which were tested was only 83.9.

The weight of the liver varied in light horses from 3.65 and 7 kg, that of the spleen between 0.80 and 2.20 kg. In the case of heavy horses, the weight of the liver was ascertained to be from 4.45 — 9,20 kg, and that of the spleen from 0.8 — 2.20 kg. The weight of liver and spleen was very variable, and depended greatly on nutritive conditions. On the average, in the case of the heavy horses investigated, the absolute weight of the liver was greater than that of the light horses, but reckoned per 100 kg living weight, it was less.

The amount of blood was not accurately measured, and only in the case of some of the horses. On an average, it amounted to 33.1 kg or 7.7 kg per 100 kg live weight per horse in the case of light horses.

The average result of 25 tests gave 38.0 kg of blood, or reckoned per 100 kg of live weight, 6.2 kg for the heavy horses, thus relatively less than that possessed by the light horses.

The haemoglobin content was obtained by the Plesch method, and showed considerable variation, the average in the case of the light horses being 12.4 %, in that of the heavy horses only 11 %.

The greater heart capacity per 100 kg live weight possessed by the light horse, its larger blood supply (measured in the same way) and the higher haemoglobin content of its blood, makes it possible for more oxygen to be conveyed to the tissues of the light horses, in times of maximum work than to those of the heavy one.

In measuring the fore-limbs, the two superior side extremities of the scapula were marked with chalk, and joined by a straight line divided in half, from this point of division, a line was drawn to the extremity of the knee-joint. This line is equal in length to the scapula, and it gives, in addition, the angle which the latter makes with the vertical.

The writer calls this the shoulder-angle.

A small depression in the lower end of the fore-arm, and also one on the side of the carpus are indicated by white chalk marks and the distance betwen these two points is measured.

These latter, when joined, form one, or rather, two triangles of which the angles are determined by trigonometry, and which are identical with those which the parts of the fore-limbs make with one another. In the case of the hind-legs, in addition to the length of the bones, the angles of the latter are also determined.

The average shoulder length was as follows:

	cm.
In thorough-breds	48.2
» heavy horses	47.7
» trotters	43.9

Average length of humerus (upper arm):

	cm.
In heavy horses	37.0
» light horses	35.9
» trotters	31.9

Average measure of radius and ulna (fore-arm):

	cm.
In trotters	41.6
» heavy horses	40.2
» light horses	39.6

Average of scapula angle:

In heavy stallions	41° 28'
» dray horses	39° 5'
» trotters	35° 57'
» light horses	34° 48'

Average of angle of scapula with humerus:

In trotters	97° 50'
» dray horses	89° 59'
» thorough-breds	89° 46'
» heavy breed stallions	86° 24'

Average measure of ellow-angle:

In trotters	128° 39'
» heavy breed stallions	127° 56'
» dray horses	125° 20'
» thorough-breds	124° 36'

The scapula-humerus angle of heavy draught horses was in all cases larger, and the scapula somewhat more upright, than in the case of heavy stallions, probably this difference is due to the slight shortening of the muscles in dray-horses, caused by hard work.

The measurements of the hind legs taken per 100 cm of the height of the withers, are on an average:

a) *Length of thigh bone (femur):*

	cm.
In dray-horses (= heavy horses)	32.3
» trotters	31.7
» Post horses	31.1

b) *Lengih of fibula (height of withers = 100):*

	cm.
In trotters	26.9
» Post horses	24.4
» dray-horses.	23.8

c) *Metatarsus (Height of withers = 100):*

	cm.
In trotters	22.8
» Post horses	22.2
» dray horses	21.6

Average angle made by the pelvis with the horizontal:

In dray horses	22°
» Post horses	19° 5'
» trotters	19°

Average pelvic angle:

In dray horses	96° 31'
» Post horses	93° 55'
» trotters	89° 3'

Average angle of knee-joint:

In dray horses	136° 27'
« Post horses	134° 5'
» trotters	131° 53'

Average angle of hock:

In trotters	149° 25'
» Post horses	148° 56'
» dray horses	145° 49'

Considerable differences in the angles and measurements of the limbs occur, as is natural, between individual animals, but, nevertheless, in each of the types of horses investigated, it was possible to show a distinctive character of form and position of the limbs.

This can only be explained as being the result of adaptation, throughout many generations, to the work the horses were required to perform. The fore and hind legs show the same adaptations, which we must regard, not as mal-formations, as has been surmised in the case of the trotter, but as the forms most suited to the work for which the animal is employed. (The precise data referring to all these measurements may be found in the above mentioned work).

DIFFLOTH, PAUL. **Horse Breeding in Tunis.** (L'Elevage du Cheval en Tunisie). — *La Vie Agricole et Rurale*; II Année, No. 8, pp. 193-197. Paris, 20 Janvier, 1912. **680**

Tunis

At the time of the French occupation of Tunis in 1881 the horses were a very poor lot. They were the result of a cross between the Barbary and Arab races, and had no uniform characters. The natives took no care of their horses and preferred the mule.

In 1881 a French Company established at Sidi-Tabet, 15 ½ miles from Tunis a breeding stud, consisting of 8 stallions (4 of pure English blood) and 40 mares of English, French and native races. The results were not satisfactory, and in 1895 it was decided to return to the Barbary and Arab races - being varieties suited to the soil and climate.

To-day the breeding stud of Sidi-Tabet comprises 4 Syrian stallions, and 60 mares: 40 of pure Arab blood, 8 Arab-Barbs, and 12 Barbs. The average annual birth-rate is 25.

In 1884 a remount service was established in Tunis, which combines also that of the breeding stud. In 1885 there were 9 covering stations with 29 stallions; in 1910, 26 stations with 120 stallions, 83 being Barbs, 25 Arab-Barbs and 12 of pure Arab blood. The Arab-Barb cross is a success, the offspring showing a happy union of the grace of the first with the strength and temper of the second. To spread the race as far as possible, all coverings are gratis. In 1891 the Remount Commission made 77 purchases, and the annual average is now between 120 and 190. The high prices paid (the minimum being £22) insure the acquisition of the best animals. These horses are frugal, with great power of resistance, very steady, docile, good jumpers, of average gait, and of a short and well-set build; in a word they are thoroughly serviceable. Their chief defects are: small buttocks and a lymphatic constitution, and it is just in these particulars that the Arab blood is beginning to tell favourably.

A Breeding Service under the direction of the Board of Agriculture and Commerce was established in 1895 and in 1896 a stud-book was introduced for Barbs and Arab-Barbs. In 1910 the number of entries amounted to 1 544.

The Arab pure bloods and the Anglo-Arabs are entered in the French stud-book.

A special stud-book for poneys was introduced in 1902.

In 1896 prizes were instituted. They are distributed (in principle, at each meeting) by the Stud-Book Committee as follows: 2 prizes of £4; 5 prizes of £2; from 10 to 12 honourable mentions, worth 16 shillings each.

Since 1896 the purchase of these horses by neighbouring countries increased so rapidly that in 1904 the Government was obliged to put an end to a practice which was threatening to destroy all that had been gained by so much sacrifice. By the Decree of May 15, 1904 a tax of £2 is levied for every young horse exported under 4 years, and one of £3 for fillies or mares under 6 years. This notwithstanding, about 600 horses are exported every year.

CATTLE.

681 HUTTON, G. H. **Winter Beef Making out of Doors in Northwest Canada.** — *Report of Experimental Farms, Year ending March 31st, 1910*, Department of Agriculture, Ottawa.

Canada

In order to ulilize by feeding a quantity of frosted wheat having a market value of 35 cents per bushel, 19 steers, two and three years old, were purchased to be fed out of doors at the Dominion Experimental Farm, at Lacombe, Alberta. The steers were an average lot, being grades of Shorthorn, Hereford and Galloway breeds.

Twelve were put on feed December 8th, four on December 15th, and three December 23rd. making a total of nineteen head. One steer died during the test They averaged 1,130 pounds and cost 3 ½ c. per pound, weighed on arrival. Freight charges and travelling expenses brought the cost up to 3.658 cents per pound, or $ 744.01. Grain was fed in the beginning at the rate of 3 pounds per head per day, and was gradually increased until by February 26th, they were getting 16 ½ pounds per head per day. This was practically full feed and, during warm weather, had to be reduced, as the aim was to feed only what they could clean up in an hour.

They were fed outside in the corral and had access to a shed which was seldom used. The only expense was for lumber to build hay racks, grain tables, and for a water tank and tank heater which prevented the formation of ice on the water. The total cost of time was 222 hours. The time necessary is evidence that outside feeding may be carried on at small expense for labour as well as for equipment.

The cattle were fed 109 days during which time they made an average gain per head of 118 lbs. at a cost of $ 7.42 per 100 lbs. The total cost of the cattle feed and labour was $ 995.07. Even with the loss of one steer, the receipts from the sale of cattle, the hide of the lost steer and the profit of $ 4.75 on two hogs following the cattle, amounted to $ 1 300.45. Deducting the value of the lost steer and the food consumed by him, a profit of $ 258.24, or of $ 14.35 per head was secured. The transaction returned full market value for coarse fodder, etc., and $ 1.28 per bushel for the frosted wheat. The cattle sold for $ 5.75 per 100 lbs. live weight less 5 per cent.

GARILLET, E. **Influence of the Temperature of Drinking Water on Cows.** (Influence de la température de l'eau d'abreuvage sur les vaches). — *La Terre Vaudoise*, 4e Année, No. 4, pp. 46-47. Lausanne, 27 Janv. 1912. **682**

Switzerland

A correspondent of *La Terre Vaudoise* having asked, in a preceding number, whether the temperature of the water drunk by cows had any effect upon them, the Author answers as follows.

At the Cery dairy (near Lausanne, Switzerland) the cows are watered in the feeding-troughs and do not leave the cow-house to drink The water supplied is very cold in winter and frequently it caused a stoppage of rumination and even some cases of abortion.

In 1902 this state of things was remedied by the use of water reservoirs formed by sheet iron cylinders, which were fastened to the ceiling of the cow house, over the passages. These cylinders are connected at one end with the main water supply pipes and at the other with the feeding-troughs.

By the turning of one cock they can be filled, and by another one their content can be emptied into the feeding-troughs.

They hold enough liquid to water all the cows once. They are filled in the evening for use in the morning, and *vice versa*.

The warmth of the cow-house, about 59 to 64 ½° F., is enough to warm the water in the cylinders, so that since these reservoirs have been in use, none of the animals have suffered from the effects of the excessively cold water to which they were formerly liable.

It appears also that this new method has a favourable influence on the productions of milk; anyhow it is since the fitting up of these reservoirs that the milk yields have increased. The average yearly milk yield per cow was:

(With reservoirs) period 1902-1911	790	gals.
(Without ») » 1895 1901	741	»
Increase	49	»

This increase would probably have been even greater if it had not been for the following circumstances:

1. In 1906, 1907 and 1908, some of the cows suffered from vaginitis; they gave less milk and some of them had to be disposed of.

2. 1909 and 1910 were rainy years and the forage was not the best for the production of milk; 1911 was a dry year and the yield of milk was low.

Before the use of these cylinders the temperature of the water supply in the cow house sank sometimes as low as 37° F., whereas now it is never below that of deep springs (43° to 50° F.).

The Author concludes that these reservoirs have a two-fold advantage: diminution of accidents (stoppage of rumination and abortion), and increase in yield of milk.

688 HERTER and WILSDORF. **Loss in Weight of Fattened Cattle.** (Gewichtsverluste der Mastrinder von der Erzeugungs- bis zur Verbrauchsstelle). — *Arbeiten der Deutschen Landwirtschafts-gesellschaft*, Heft 182. Berlin, 1911.

Germany

Cattle lose in weight on their way to the slaughter-house. This loss should be calculated as exactly as possible by the owner, so that on consulting the quotations of the slaughter-houses he may be able to ascertain the real worth of his cattle.

The above work endeavours to determine the amount of this loss.

Messrs Herter and Wilsdorf asked the exhibitors in the 35th Berlin Cattle Show to give them the exact weights of the animals before they were sent to Berlin. On their being again weighed when they arrived, it was found that 25 calves had lost on an average 5.16 %, and 238 full-grown animals 5.47 %.

At the 36th Berlin Cattle Show, 1910, more exact details were obtained.

The losses in weight on the journey showed great individual differences, and did not appear to depend alone on the time involved.

Differences of age and sex, of biological and physiological condition, perhaps also of food, were doubtless the other determining factors.

The following table shows the average results obtained :

	Number	AGE	Average weight of the animals before transport Cwts	Loss during transport, in percentage of weight	Total Railway Mileage	Railway Mileage which caused 2.2 lbs loss of weight in each animal *
Calves	42	Up to 4 ½ months .	3.33	4.2	167 ¾	23.60
Bulls	11	3 ½ years and upwards	18.77	4.5	148 ½	3.47
Cows	27	» » » »	14.34	4.9	138	3.85
Young Bulls . . .	18	Under 3 ½ years . .	17.05	5.5	159	3.10
Cows	8	From 2 ½ to 3 ½ years	12.56	5.9	204 ½	5.40
Steers	50	3 ½ years and upwards	15.60	6.1	210 ½	4.28
Heifers and Steers	43	Under 3 ½ years . .	11.68	6.5	248 ½	6.40
Steers	145	From 2 ½ to 3½ years	13.42	7.3	192	3.85
Total	344					

The animals came from all parts of Germany.

SHEEP.

Sheep-Breeding. Wool Production and Trade in Italy. (Allevamento ovino, produzione e commercio delle lane nell'Italia). Ministero di Agricoltura, Industria e Commercio: *Atti della Commissione per lo studio della produzione e del commercio delle lane in Italia.* Vol. I. — *Istituzione della Commissione; Relazione riassuntiva e verbali*, p. 106. Roma, G. Civelli, 1911. Ministero di Agric., Ind. e Comm. — *Censimento generale del bestiame del 19 marzo 1908* (*legge del 14 luglio 1907*, No. 535), pp. LXXI + 691 + 16 tav. Roma, G. Civelli, 1911. — *Inchiesta parlamen-* **684**

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* 1 mile on foot was calculated as equal to 12 miles railway ; and
1 mile in a waggon » » » » 5 » »

tare sulle condizioni dei contadini nelle Provincie meridionali e nella Sicilia, Vol. II: Abruzzi e Molise, T. I; Roma 1909; Vol. IV: Campania, T. I; Roma 1909; Vol. V: Basilicata e Calabria, T. III; Roma 1910; Vol. VI: Sicilia, T. I, Roma 1910.

Italy

Sheep and Goat Breeding in Italy. — Statistical data taken from the census of March 19, 1908.

	SHEEP					Goats
	Male and female lambs of more than a year old	Rams reserved for breeding	Females	Castrated	Total	
Piedmont	71 769	6 363	165 813	8 800	252 745	149 711
Lombardy	40 252	5 550	68 980	9 649	124 431	97 940
Venetia	67 549	4 356	123 098	6 607	201 410	79 098
Liguria	48 845	3 638	139 938	1 297	193 718	48 721
Emilia	95 789	6 167	243 433	2 111	347 505	14 112
Marches and Umbria	251 737	16 321	667 082	30 767	965 909	124 571
Tuscany	243 667	20 182	851 587	10 696	1 126 132	101 204
Latium	183 248	69 536	951 863	16 015	1 220 662	112 556
S. Adriatic region	523 519	70 413	1 390 588	23 766	2 008 286	310 321
S Mediterranean region	481 454	92 540	1 284 586	27 811	1 886 391	859 029
Sicily	186 714	41 661	704 926	21 697	958 998	311 044
Sardinia	543 901	46 082	1 278 322	8 436	1 876 741	506 566
Total . . .	2 738 244	382 809	7 874 216	167 657	11 162 926	2 714 878

In comparison with the census of 1881, there is an increase of 29.86 % in the number of sheep and of 34.65 % in that of goats. There are in Italy, on an average, 38.94 of these animals per km^2 (per 0.3861 sq mile) of which the maximum occur in Latium (101.04) and in Sardinia (77.84).

Amongst European countries, Italy ranks fifth in the production of sheep and goats, as is shown by the following table:

	Year to which the census refers	SHEEP			GOATS		
		Number of Sheep	Per (*d*) km²	Per 100 inhabitants	Number of Goats	Per km²	Per 100 inhabitants
Italy	1908	11 162 926	38.94	32.92	2 714 878	9.47	8.01
Austria	1900	2 621 026	8.73	10.27	1 019 664	3.40	3.99
Belgium	1895	83 695	2.84	1.17	257 669	8.75	3.60
Bosnia-Herzegovina	1895	981 907	19.21	73.49	1 447 049	28.31	108.303
Bulgaria	1905	8 131 004	127.54	307.49	1 384 128	21.71	52.34
Denmark	1903	876 830	22.04	35.57	38 984	0.98	1.58
France	1907	17 460 284	32.55	44.81	1 421 009	2.65	3.65
Finland	1906	919 467	2.44	32.39	5 674	0.001	0.20
Germany	1908	7 703 710	14.25	12.70	3 538 970	6.53	5.
Great-Britain	1908	27 119 730	117.63	68.07	—	—	—
Ireland	1907	4 126 106	49.24	94.07	246 286	2.93	5.61
Luxemburg	1900	8 467	3.27	3.44	11 344	4.38	4.60
Norway	1904	998 819	3.7	47.60	214 594	0.66	10.23
Netherlands	1904	606 785	18.39	11.35	165 497	5.01	3.10
Rumania	1900	5 655 444	43.16	104.6	232 515	1.77	4.30
Russia in Europe and Poland (*a*)	1907	No. of head 46 589 267 per; km² 9,43: per 100 inhabitants 45.30					
Spain	1908	16 119 051	31.95	82.38	3 355 404	5.65	17.14
Sweden	1907	1 021 727	2.28	19.29	65 798	0.14	1.2
Switzerland	1906	209 997	5.07	6.33	362 117	8.75	10.92
Hungary	1908	7 872 742	24.18	40.88	277 060	0.85	1 44
Argentina	1908	67 211 754	23.95	1 120.20	3 945 086	1.41	65.75
Canada	1908	2 831 404	0.29	52.71	—	—	—
United-States	1908	54 631 000	5.82	64.87	1 870 599	0.20	2.22
Japan	1907	3 949	0.01	0.008	80 901	0.21	0.17
British India (*b*)	1907-1908	18 033 095	3.74	6.11	25 220 509	5.22	8.54
Australia (*c*)	1905-1908	107 900 766	13.60	2 424.74	97 179	0.01	2.18

a) This no. of head includes the sheep and goats of N. Caucasus.

b) Without Bengal.

c New Zealand 1907; New South Wales 1907; S. Australia 1905 1906; Tasmania 1908; Victoria 1907; W. Australia 1907.

d) km² = 0.3861 mile.

Sheep Breeding in Latium. — In the Agro Romano, and in nearly the whole of Latium, the breeding of these animals is nomadic and quite primitive on the large country estates.

Of late years the breeds have greatly deteriorated on account of the dividing up of large farms, the scarcity of shepherds and consequent increase in *moscetti*, poor owners of small flocks; and also through the increased export of baled forage which has deprived the sheep of the produce of the best pastures. Sheepfolds are entirely absent in Latium, for the tenant (*mercante di campagna*) cannot afford during his short tenancies of 9 to 12 years to make sheepfolds, even in the cases where the flocks are his own property.

Nevertheless, the law for the improvement of the Roman Campagna (1) obliges owners in districts where a thin stratum of soil resting upon impermeable rock renders the ground unsuitable for other purposes than stock-raising, to build permanent masonry sheepfolds with dwellings for the shepherds and cheese dairies. In this way the cheese-making industry will at the same time be promoted.

In the district of Viterbo, that part which borders on Umbria and Tuscany is subdivided into numerous estates where intensive cultivation is practised to which is added the rearing of goats under cover, while in the south portion, where there are large estates, goat breeding is largely carried on in the open, the animals being, driven from the plains to the mountains and viceversa, according to the season, or else are migratory only during some portion of the year. The production of cheese is more important than that of wool. The travelling lectureship of Agriculture has formed a " Co-operative Society of Owners of Sheep and Goats ". A co-operative for the collection and sale of wool exists in Rome and receives annually about 240 000 kg. (528 000 lbs.) of wool; another is established at Foggia which receives about 140 000 kg. (308 000 lbs.).

The products of the sheep and goats of Latium are, in order of importance: milk and its derivatives (the *pecorino* cheese and *ricotta*) (1) meat and wool.

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(1) Approved by the Royal Decree of Nov. 10, 1905, No. 67. Respecting information on wool production in the Roman Campagna and the work of the wool-staplers of Rome since the sixteenth century, and also respecting the improvement of the Roman Campagna and the laws relating thereto. See: CESARE DE CUPIS. *Le Vicende dell'Agricoltura e della Pastorizia nell'Agro Romano. L'Annona di Roma, giusta Memorie, Consuetudini e Leggi desunta da Documenti anche inediti.* pp. XI + 789. Roma, Ministero di Agric., Ind. e Comm. 1911. (*Ed.*).

It may be considered that a sheep of average size, under ordinary conditions produces annually 6-7 kg. (13.2-15.4 lbs.) of cheese worth 10 fr. (8*s*). 2.5 to 3 kg. (5.5-6.6 lbs.) of *ricotta* worth about 2 fr. (about 1.*s 7d*); a lamb worth 4-5 fr. (3*s 2d* to 4*s*) at the age of 40 days, and 1.8 kg. (3.9 lbs.) wool worth 4-5 fr. which gives an annual yield of about 20 fr. (16*s*.). This considerable sum has been obtained of late years, owing to the increase in the price of cheese (due to the recent and large export of this product to the United States) and by a noticeable increase in the price of wool, meat and skins. From 1890 to 1900 the annual yield of a sheep was about 15 fr. (12*s*.) represented equally by wool, milk and meat.

The experiments of Prof. Fracchia, Director of the travelling lectureship of the Province of Rome have shown that the present type of the Latium sheep, which is not specialized, is of small size but a good walker, robust and resistant; could rapidly be improved, if the pastures were also improved, especially in the plain, and if winter and autumn pastures of red clover, and of lupin and other Leguminosae were provided.

Abruzzi and Molise. -- The flocks which winter in the Roman Campagna (or Apulia) migrate in summer to the Abruzzi, where they graze on the large estates, communal properties and on the collective property of Agricultural corporations (*ville* and so called Università). Further, in the districts at the foot of the mountains and on the Abruzzi mountains the system of *compascolo* is in vogue, that is to say, that as soon as the harvest is over, the animals of all the estate owners in the district graze together on the fields, which is a great obstacle to cultural improvements. Moreover, the scarcity of artificial meadows, and the very limited culture of forage plants are important factors conducing to the instability of sheep-rearing in the Abruzzi.

The migration of flocks from the plains to the mountains in summer and back again in winter which is a very ancient custom (1) has greatly decreased of late.

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(1) *Ricotta* is made of the residual whey from cheese-making, it is heated to 70-75° and a little aeid whey added. (This addition usually is not made in the case of sheep *ricotta*). *Ricotta* consists of a coagulation of proteins containing fat globules. Analyses of Roman *ricotta* give the following percentage results. Water 43.27, fatty matters 33.21, proteid matters 11.73, lactose 10.42, lactic acid 0.43, ash 0.54. The yield in *ricotta* is from 8 to 10 % of the amount of milk used.

See: Prof. CARLO BESANA, *Caseificio*. Torino. U. T. E. T., 1908. (*Ed.*).

In the Province of Teramo only two Communes possess animals which migrate in any quantity, (Fano Adriano with 27 000 head and Crognaleto with 23 000). In Molise, there is only one commune (Capracotta) where this system is practised and in the Province of Chieti it is non-existent, while in that of Aquila it obtains in 71 communes out of 127, and affects 448 727 animals. (The difference between this number and that returned in the census given above for the Province of Aquila, which gave a return of 278 931 sheep, is explained by the fact, that on the day of the taking of the census, the migrating animals were passing the winter in Apulia or Latium.

Campania. — There are no breeds special to this district. As a rule, and, especially in mountain districts, medium and small sized sheep predominate, on the high mountains towards the Abruzzi on the one hand, and Molise and Apulia on the other, flocks of fine sheep may be met with in summer consisting of merinos, or an allied breed.

Some long-tailed Barbary sheep pass the winter near Vesuvius and the mountains of Sarno and Avella. There are also many of similar or *bergamasco* type, large animals, hornless with arched forehead and abundant thick wool of coarse quality (suitable for mattresses). In spring, very frequently, the flocks of Avellino and Benevento descend to the plains of the valley of the Sarno and of Nola as far as the low slopes of Vesuvius. The flocks which are few in number descend browsing as they go, and eventually remain in the above-mentioned districts, where pastures are bought and manure is sold. In December, the fields of lupin, which follow the barley are used as fodder, and towards Easter (after the birth of the lambs) the early crimson clover is consumed.

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(1) The " Tavoliere di Puglia " was a large extent of common pasture (extending between Mt. Gargano and the sea from Molise and the Abruzzi on the north to the provinces of Bari and of Lecce in the South) of which the origin goes back to the Roman conquest of the Daunians and Peucetians. It included a vast district, which on being confiscated from its original owners, became public property, which the Treasury let to the shepherds who descended in winter from the mountains of Samnium and Lucania.

All succeeding governments until 1806 and again from 1817 to 1865 found that the rent of the *Tavoliere* constituted one of their chief sources of revenue.

The Italian law of March 23rd 1865 allows the easements to become alienable patrimony. Thereupon ensued, in Apulia, the transformation of pastures into corn land and of the latter into vineyards, olive-yards and almond plantations.

See: O. BORDIGA, *Economia rurale. Parte I. I fattori della produzione agraria*, pp. 140-143. Milano, Vallardi. (*Ed.*).

One hundred sheep eat in one night the grass of 500 to 700 m² (1.23 to 1.8 acres) if it is will developed, and of 450 m² (1.1 acre) only on fields manured with chemical fertilizers.

The milk is sold in its natural condition. With a flock of 100 sheep containing 80 milch ewes, from Dec. 1st to April 30th, the following products can be obtained:

	£ s d	L	s	d
Milk produced in 150 days 1 452 gals at 10.82*d* per gal.		65	9	0 ¼
Dung about 7 3/4 *d* per night		4	15	2 3/4
Wool: 2.2 lb. good quality and 0.55 lb inferior, per head; 220 lb at 10.8*d* per lb., and 55 lb at 7.8*d* per lb.		10	10	3 3/4
Lambs, 80 at 3*s* 6.86*d* each		14	5	8 ½
Total . . . £		95	0	9 ¼
Pasturage, about 660 sq. yards per day 20.37 acres at £1.12 per acre,	32.14.9			
Shepherd and boy	15.17.5 ½	48	12	2 ½
Profit . . . £		46	8	6 3/4

This sum has to cover seven months' grazing on the mountains, and risks and losses.

Basilicata and Calabria. — Sheep-rearing is decreasing, contrary to what might be gathered from a comparison of the former census with the preceding one, although the figures of the latter were, in fact, very low. In Basilicata, this industry is of greater importance than in Calabria.

In the former, it is carried out extensively on small and medium scale, and on a large scale also, especially in the eastern plain district. The Moliterno cheeses are renowned and much exported. The average annual export of fine wool amounts to about 6 000 qls. (11 760 cwt.). In Calabria the principal breeding district is that of Cotrone where a special kind of cheese is produced.

The following is an example of the organization of the industry. Of a large flock of 5 000 head, 4/5 are sheep and 1/5 goats, divided into *morre* of about 300 head each. The sheep consist of 1 *morra* of sheep, 7 *morre* of milch ewes, 2 *morre* of *scavite* (ewes in their second year which are about to be mated) 2 *morre* of female lambs, 2 *morre* of ram lambs, total 14 *morre*. Milking begins in December, the cheese is sold in the lump in July, it is weighed and delivered every ten days from the commencement of the following December. At the end it is reckoned up. The ripening of the cheese is the business of the buyer, who tries to obtain a constant type.

The flocks go to the mountains in the summer, where they graze on the communal land paying the *fida;* in winter, they descend to the plains and are pastured on rented ground (1).

Sicily. — Sheep as well as cattle are reared here on the migratory system. Cattle, sheep, and goats graze together sometimes, with the idea of turning to account the different plants in the pasture, but more often they are kept apart.

The natural pastures, in the neighbourhood of the crops, occur everywhere, but are not kept up, and are generally poor. Permanent pastures in mountain and coast districts occupy land which is not adapted to cultivation. Those on the coast, which are earlier, serve as winter grazing grounds. By the spring, they are already exhausted. and the drought prevents the grass making a new growth. The animals are then driven to the pastures of the intermediate zone, where they remain until the end of May, then they migrate to the mountains, to return in the autumn to the coast.

Improvement of Breeds of Sheep. — The Commission for the study of the production and sale of wool in Italy proposes to establish in Latium a National Sheep station for the purpose of providing an improved type of animal for breeding purposes.

In the Royal Depôt of improved breeds at Portici (Naples) there are some of the Rambouillet breed, but scarcely enough to satisfy even a small part of the local requirements. With regard to the improvement in the production of wool, it would be necessary in the case of the Apulian wools (which are good, but short) to effect crosses with the Rambouillet ram, or the merinos of Port-Philip, while the sheep of northern and central Italy as well as those of Basilicata and Calabria are best crossed with Apulian merinos, or Southdown and Dishley rams. The Dishley-merino cross is the most successful.

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(1) In Calabria of Cosenza and Catanzaro the flocks pass the winter on the pastures of Sila, the remains of a very ancient estate of more than 100 000 ha. (more than 247 000 acres) which the Romans in A. U. C. 476. took from the conquered Bruzi. The law of May 25th 1876 assigned to the estate 3 500 ha. (8 645 acres) of unalienable forest, and left to the communes about half the land to be divided among the inhabitants. See O. BORDIGA, op. cit. (*Ed.*).

Very good results have been obtained at Portici by Prof. Baldassare (*Bollettino di Notizie agrarie,* Anno XIX, 1897. Febbraio, No. 5, p. 158) in crossing the Rambouillet race with the Apulian varieties locally called *sopravissane* and *gentili.*

The half-bred animals are distinguished by earlier development, a greater weight and a heavier and better fleece (valued at 2.10 fr. or 2.20 fr. per kg. (9.1 to 9.5*d* per lb.) as against 1.90-2 fr. (8.2 to 8.6*d* per lb.) for the local wool: the economic results are as follows:

Half-breeds: 3 kg. (6.6 lb.) of wool at 2.10 fr. (9.1*d*) . . .	fr.	6.30	(5 *s* 0*d*)
Local varieties: 1.67 kg. (3.7 lb.) at 2 fr. (8.6*d*).	»	3.34	(2 *s*. 8*d*)
Difference in favour of half-breeds .	fr.	2.96	(2 *s*. 4*d*)

Equally good results were obtained by Prof. Ricco, at the Experimental Farm of Sant Alessio (Rome), in crossing the Rambouillet race with the Latium sheep, as is shown by the following table:

	kg.		lbs.
Average weight of Latium sheep of 4 ½ years .	40	=	88
» » half-bred » » » .	55	=	121
» » » lambs of 2 ½ years	80	=	176
» » » » 1 ½ year .	55	=	121
» » » » 4 ¼ months	25	=	55
Weight of wool per Latium sheep.	2.5	=	5.5
» » » half-bred	4.0	=	8.8
» » » Rambouillet ram	7.0	=	15.4
» » » half-bred »	5.5	=	12.1
» » » Latium »	4.0	=	8.8

The Southdown sheep was introduced into Italy by the Ministry of Agriculture but the results have not been always as successful as was anticipated, being almost negative in the Abruzzi (Stock Breeding Stations of Alanno (1) and Scerni).

In Sicily (Roy. Stock Breeding Institute of Palermo) pure bred Southdowns cannot stand the climate, they get chronic intestinal catarrh and die before they are two years old, but on the other hand, South down × Sicilian are adapted to the climate and are superior to the native sheep especially as regards milk-yield.

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(1) Good results were obtained at the Royal Stock Breeding Station of Alanno, Chieti, in crossing the local sheep (*pagliarola*) with the mountain breed

Italian Wools. — In Piedmont, Liguria, Venetia and Emilia sheep-rearing is neglected, the wool produced is little in quantity and of poor quality, it is used in the local manufacture of coarse cloth.

The Tuscan wools are very strong and white, but coarser than the Roman or Apulian wools. They are easily combed and give a good yield when washed. (78 % as against 58 % in the case of the Apulian wools and 65 to 68 % in that of the Roman wools).

The wools of the Abruzzi, which are the produce of sheep which live all the year in the district, are poorer in quality and yellower than those of Apulia, although they are equally good for felting. They card and comb well.

The Roman wools are divided into fine " sopravissane ", medium " sopravissane ", " lucolesi ", " vissane ' , " amatriciane ", " ascolane " (" cingolane "). The fine " sopravissane " wools are the resulting of crossing Spanish merinos with Lucoli sheep, the medium sopravissane, of crossing small sopravissane rams with " vissane " ewes, and the " vissane " wools are produced by mating " sopravissane " rams with ewes from Umbria and Visso.

The latter wools are of coarser quality than those of the " sopravissane ". The " amatriciane " sheep are said to be the result of crossing the Abruzzi type with the " vissane ". The wools called ascolane and cingolane are commoner ; those of Umbria and the Marches, the products of non-migratory sheep, are a little yellow, but somewhat brittle, the quantity is good, but the wool is not much liked, it is only useful for carding.

The number of sheep grazing in Latium is estimated at 2 200 000 head and the amount of wool they furnish is about 3 000 000 kg. (59 000 cwt.).

(*bergamasca*) especially as regards meat-production. Measurements of three-year old *pagliarola*:

Length of wool	19 cm. (7.4 in.)
Thickness	28.33 μ
Live weight	48 5 kg. (106.7 lbs.)
Live weight of three months old lamb	13 68 kg. (30 lb .)

Measurements of half breed *bergamasca* sheep, respectively:
19.75 c.m. (7.6 in.) 30.38 μ 78.8 kg (173.4 lb.) 24.5 kg. (53.9 lbs.),
See: Dott. GIOVANNI SAVAZZINI, *Le pagliarole. Considerazioni sull'allevamento ovino nella provincia di Chieti*, p 28. Lanciano, 1910. (*Ed.*),

The sheep of Apulia are the results of crossing with Spanish rams of Estremadura and Catalonia, together with careful selection. The Apulian wools are the finest, whitest and most elastic in Italy and are much appreciated for combing and worsted. When combed, they can be spun as fine as 50 000 metres per kg. (about 24 620 yards to the lb.) the wools from Buenos-Ayres as fine as 70 000 metres per kg., the Australian wools are spun to 100 000 and 210 000 metres per kg. At Altamura a great trade is done in mattress wools. The wools of Basilicata are of medium type. Those of Gravina and Matera yield well and are much appreciated. The others are commoner, but long, thick, very adapted to combing and can be spun to 36 000 m. (17 726 yards per lb.). When combed, they are used for making stockings and when mixed with Roman wools they are suitable for worsted.

The Calabrian wools are of two qualities, fine and medium. The former comes from crossing merinos with local sheep, the wool is long, but the fibres are weak, and it is used for military cloth; the latter is long, fairly strong, good for combing and spins as fine as 26 000 metres (12 800 yards per lb.). It is used in the manufacture of stockings.

The wool of the Sicilian sheep is mixed with hair, and is coarse and only suitable for mattresses and coarse cloths. Each sheep produces an average of 800 to 1 200 gr. (1.76 to 2.64 lb.) of unwashed wool, which on washing loses at least half of its original weight. The price of these wools (unwashed) varies from 1 fr. to 1.30 fr. per kg. (about 4.5 to 5.6*d* per lb.). Wool is not exported from Sicily, as the supply is insufficient for the local demand. In conclusion, the Sicilian sheep, which have characteristics in common with the thin-tailed sheep of north Africa are specialised as producers of milk which made into cheese, represents an annual revenue of 8*s* per head.

The Italian Wool Industry. — The national production of woollen materials which in 1866 amounted to 12 500 000 kg. (27 500 000 lbs.) worth 74 000 000 fr. (about £2 960 000), in 1908 reached 31 900 000 kg. (70 180 000 lb.) worth 250 000 000 fr. (about £10 000 000). During this time the importation of foreign wools has also considerably increased, from 3 500 000 kg. (7 700 000 lbs.) in 1866 to 18 600 000 kg. (40 920 000 lbs.) in 1908.

From 1876 to 1908 the number of spindles increased from 248 249 to 489 786; that of machine looms from 2 571 to 10 567. The number of persons employed in the wool industry has risen from 24 930 to 38 000 as against 2 500 000 employed in England, Germany and France in the same trade.

685 Ross, F. E. **Peruvian Wools** (1). — *Peru To-Day*: Vol. III. No. 10, pp. 25-31; Lima, Jan. 1912.

Peru

The Departments of Arequipa, Puno, Cuzco, Apurimac, Ayacucho, Huancavelica, and indeed all the Peruvian uplands, produce wool. Arequipa handles 90 % of the alpaca wool exported, all the llama, and all the vicuña wool and over 95 % of sheep's wool. As regards the latter the departments of Caylloma, Ayacucho and Cuzco provide the best. The alpaca and the llama thrive in a restricted zone, not lower than 5000 feet, and are domesticated.

The vicuña is usually found at a higher elevation than the alpaca. It resists domestication, and to prevent its becoming extinct, it is protected by law, and may not be shot.

It is also forbidden to export live alpacas and vicuñas, as they invariably die. About 100 000 alpacas are clipped for their wool. This is done every two years and they then yield about 5 pounds of long wool. The grades are: fine, coarse, skin wool (from dead animals), short, and the scraps left over, which are called " locks ". The llama wool, being inferior to the alpaca, is put in a class by itself. The first two qualities are then sorted into five grades by colour. The vicuña wool costs at present 10 shillings a pound, owing to its wonderful softness, and its quality of impermeability, coupled with its scarcity.

Sheep thrive best on the table-lands, but during the rainy season they are driven down to the lower ranges, where they stay for two or three months. Judging from the known production of wool, their number may be roughly estimated at from 7 to 10 millions. The native *Sierra* sheep yield on an average 2 lbs of wool annually, and when crossed with *Merino* 3 to 4 lbs. Crossed with *Punta Arenas* they may yield as much as 6 ½ lbs. Many difficulties have been encountered in crossing pure blood animals from low countries with the native Mountain breeds, so as to combine the hardiness of the latter with the good qualities of the former. But the efforts made have now been crowned with success.

Sheep's wool is first washed (losing thereby 40 to 42 % of its weight), and then packed in sacks holding 200 lbs. It is divided into three qualities, the first being Merino, which constitutes about 8 % of the total in Arequipa. This fetches about 13 pence on the Liverpool market.

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(1) The value of wool exported in 1907 was £428 129, and in 1908 it was £297 000. See *Statesman's Year-Book*, 1911. p. 1106. (*Ed.*).

First quality comes next, good long white wool, worth about 12 pence. Second quality brings 9 pence.

There are four woollen mills in Peru: at Santa Catalina. Marangani, Lucre, and Huaro.

PIGS.

686

BALSTER. **Method of Fattening Pigs at Brinkum (Kr. Syke).** (Brinkumer Mastmethode). — *Mitteilungen der Vereinigung Deutscher Schweinezüchter:* 19. Jahrg., No. 3, pp. 47-50. Berlin, 1. Februar 1912.

Germany

At Brinkum in the Syke district, near Bremen, there has been in the last ten years a remarkable development of the pig fattening industry, carried out not by regular breeders or landlords, but by tradesmen, working-people and petty officials, obliged to buy everything The pigs – the improved Hanoverian race — are bought direct from breeders, or from middlemen.

Animals with broad backs, long bodies, and large bellies are preferred, because they are likely to be great eaters. And the more they consume, the sooner they can be slaughtered, and the greater the prospective gain.

The food consists exclusively of small Russian barley, ground moderately fine, and mixed with water to form a mash. More water is added in summer than in winter. To increase the appetite, and build up the bones, 50 to 60 grs. of fish-meal (with the fat removed) is given to each animal daily. It is not mixed with the barley mash, but scattered in the trough when the latter is almost consumed.

For the first 14 days straw litters are provided, but after that the pigs lie on the bare cement flooring of the sties. One quarter of the sty (at the back) is slightly lower than the other part; and this is found sufficient to keep the animals clean without straw.

If any pigs eat badly, it is better to sell them without delay. They are not only unprofitable themselves, but, if kept, reduce the total gain. When a pig weighs about 220 lbs, any further fattening is not remunerative.

If the pigs fetch a good price and the barley is not too dear, this system of fattening brings in an average profit of 10 shillings per head. At the present moment however the situation is not very favourable, as barley has become very dear, and the selling price of the animals has fallen.

687 STEVENSON, W. **Report on Seven Experiments on the Feeding of Pigs.** — *The West of Scotland Agricultural College: Bulletin*, No. 57. *Tenth Report*, pp. 249-334. Glasgow, 1911.

Great Britain Scotland

The West of Scotland Agricultural College carried out between 1905 and 1910 seven experiments on the feeding of pigs with more than 200 animals, mostly cross-bred Yorkshires. The different lots were kept throughout the period of experiment as far as possible under the same general conditions, only they were fed on different rations. In each experiment the pigs were divided into a number of lots — 4 to 8 in each — and each lot had its own diet. Food was supplied practically *ad lib.*, and in other respects things were managed in the usual way.

Each animal was weighed at the beginning of the experiment and at intervals of 28, 28, and 21 days respectively during growth and fattening, and again at time of slaughter. Tests of the quality of the bacon from the different rations were made by qualified bacon-curers, both before and after curing, and after cooking. The foods were: barley meal, maize meal, " Paisley " meal (a by-product from maize in the preparation of " corn flour "), rice meal, wheat bran, raw and cooked potatoes, separated milk, and whey.

The cost of the different foods was calculated at their market prices; the milk products were provided by the Dairy School, Kilmarnock; separated milk was valued at 3/4 *d.* per gallon, and whey at 1/2 *d.*

The results which are given with great detail in the report, can here only be briefly summed up.

It was found possible to utilise whey profitably by feeding it alone to pigs. When fed on whey only during the last 11 or 12 weeks, the animals increased in live weight at an average rate of 1 lb. per head per day and gave a return of 1/2*d.* per gallon for the whey, and a further sum of 8*s.* 7*d.* per pig towards other expenses.

Barley meal and water, with a little wheat bran, without any dairy by-product, proved to be the least satisfactory food.

The average increase per head per day was only 0.8 lb. and the average balance only 1*s.* 2*d.* per pig.

Whey mixed with any meal was much more satisfactory.

With only one exception, whey mixed with maize meal gave greatest average increase per head per day and the best returns.

Whey and "Paisley" Meal gave a greater average increase in live weight and a better return, than whey and barley meal, with only one exception.

In three experiments separated milk and barley meal gave greater increases in live weight than whey and barley meal, and the relative values of separated milk and whey were found to be approximately as 3 : 2.

In one test with "Paisley" meal and whey it was found that warm food produced a greater increase in weight than cold food, and there was a balance of 5*s*. 4*d*. per pig left to pay for the warming of the food.

Whey with *raw* potatoes and a mixture of equal parts barley meal and maize meal gave better results both in live weight increase and in monetary return than whey with *cooked* potatoes and a similar mixture of meals.

A mixture of dry and fluid food (whey or separated milk and meal) was found to be most satisfactory, and the smallest amount of dry matter was required when maize meal was given at the rate of 2 lbs to 2 ½ gallons of whey.

In the experiments of 1909 and 1910 the most satisfactory results were obtained from a ration of one part barley meal, one part maize meal, and eighteen parts whey, or about 1 lb. meal to 1 gallon whey. The average balance per pig, after deducting the cost of the food was 30*s*. 8*d*. The least profitable ration was obtained from a mixture of whey, barley meal, and rice meal.

Female and castrated male pigs proved of practically equal merit in producing bacon.

As the weight of the pig increased, so did the quantity of food required to produce 1 lb. live weight become greater. At 214 lbs. live weight it required 50 % more food to give the same increase than at 118 lbs. live weight, and 19 % more than the average amount required from 118 lbs. to 214 lbs. live weight.

Heavier pigs on the same diet yielded higher percentages of carcase than lighter pigs. This was partly due to the kind of food. Whey and maize meal produced the highest percentage, 71.8 %, of carcase to live weight, and of bacon to carcase weight.

Barley meal, without skim milk or whey, produced inferior bacon, while barley meal and separated milk in every test gave the best quality. When whey was used in quantity sufficient to provide a considerable proportion of the dry matter of the food, a good quality of bacon was obtained with either barley, "Paisley" or maize meal.

688 **Evvard, John M. The Brood Sow and her Litter.** — *The Breeder's Gazette*: Vol. LXI. No. 7 (1577). p. 395. Chicago, February 14, 1912.

United States

A series of fundamental brood sow investigations have been carried out at the Iowa Experiment Station. It is now realised that corn (maize) alone is not an efficient ration for a pregnant sow, so as to secure strong healthy offspring.

Thirty-five gilts were divided into seven lots with five in each lot. They were good high-grade and pure-bred Duroc Jerseys, closely related. Corn (maize) was the basis of all the rations, and it was supplemented in various lots by meat meal, mixed grains, clover hay and alfalfa. The two heaviest gaining lots farrowed on the average 8.57 pigs; the two lightest gaining 7.5 pigs, and the intermediate 7.43 pigs. This bears out the view that increase of thrift at breeding time increases the number of offspring.

The following table shows the results obtained.

Lot No.	Supplement to corn (maize) ration.	Average number in litters	Average weight of litters lbs.	Average weight per pig. lbs.	Average number of pigs saved per sow at weaning
1	None	7.6	13.20	1.74	5.2
2	1-30 meatmeal	7.4	14.89	2.01	6.2
3	4-30 meatmeal	8.8	19.62	2.23	7.0
4	Grain mixture	10.6	19.50	1.84	7.4
5	Cut clover and molasses . .	7.0	15.32	2.19	4.6
6	Clover in rack	6.4	14.17	2.21	5.6
7	Alfalfa in rack	7.6	17.41	2.29	6.4
Average of all		7.9	16.30	* 2.07	6.1

* Average weight of all pigs born.

The lightest and weakest pigs at birth, as well as the lightest average litter, came from Lot 1. In Lot 2, the ration 1 lb. meatmeal : 30 lbs. ear corn (maize) raised the average weight from 1.74 lbs to 2.01 lbs. The increase of meatmeal in Lot 3 raised it still further to 2.23 lbs. In Lot 4 the feed was corn (maize), oats, bran, middlings, and oilmeal in the ratio 33 : 3 : 3 : 3 : 2; the average number of pigs farrowed was 10.6 per sow, as compared with 7.6 in Lot 1, and the average weight per pig at birth was 1.84 lbs or $\frac{1}{10}$ lb. more than in Lot 1. In Lot 7 there was an increase of 32 % over Lot 1; and Lots 5 and 6 gave an increase of 20 %. Lots 4,5, and 7 were the only ones having pigs born dead, but the highest percentage was not more than 5.7.

The pigs born in Lot 1 were the weakest and thinnest of all, and the conclusion is clear. Corn (maize) is not satisfactory by itself, as it does not contain enough protein and ash to build up the bones and muscles.

689

HUMMEL, ALFRED, **Acorns as Food for Pigs.** (Eichelfütterung an Schweine). — *Illustrierte Landwirtschaftliche Zeitung*, 32 Jahrg., No. 18, p. 163. Berlin, 2. März, 1912.

Germany

On the Geeste Estate, Kr. Meppen, 5 000-6 000 pigs were fed last winter on acorns, to the amount of one-fourth of their daily ration.

Acorns contain little lime, protein, and ash ; therefore these deficiencies must be carefully supplied by other food. An acorn diet alone is impossible. Twenty-five pigs were fed on acorns, at first with the addition of a small quantity of albuminous food, and afterwards for four weeks on nothing else. Their bones became soft, and in some cases brittle, and their weight decreased. The intestines were gray after death.

There were no bad effects when the acorns were given in the right proportion.

Acorns have about half the food value of maize. They are best kept in heaps, like potatoes, covered with straw and earth.

690

BARTOLUCCI, A. **Pig Raising and Trade in Romagna.** (Allevamento e commercio dei suini in Romagna). — *L'Italia agricola.* Anno XLIX, No. 2, pp. 33-38. Milano, 30 Gennaio 1912.

Italy

The general census of 19 March 1908 showed the following number of pigs in the provinces of Forlì and Ravenna :

Province of Forlì	22 724
» » Ravenna	33 700
Total . . .	56 424

Which means 31.31 head per sq. mile and 7.78 per 100 inhabitants for Forlì, and 47.13 head per sq. mile and 14.05 per 100 inhabitants for Ravenna.

Compared with the preceding census of 13-14 Feb. 1881, these figures show an increase of 94 % in Forlì and 213 % in Ravenna. In all the provinces of Emilia the average increase was 169 %, the highest in Italy.

These statistics however do not give the actual number of the animals raised; for at the time when they were made the greater part of the pigs intended for use had been killed.

The pigs of Romagna belong to the following races:

1. The original brown Romagna race (" mora " or " castagnona ");
2. The half breeds, York-Romagna;
3. The pure Yorkshires.
4. The Tuscans.

Four-fifths of the whole belong to the second class; the remaining fifth almost entirely to the first class, the pure Yorkshires and the Tuscans being a negligible quantity. The latter are not raised in Romagna, but brought there for two or three months to be fattened.

The native Romagna pig (class 1.) is derived from the Iberian Race (*Sus ibericus*) of Sanson, and there are three varieties: that of Faenza, that of Forlì, and that of Rimini, the second being by far the commonest. Dr. Ballardini in his monograph * " On pig raising in the Faentino, " observes that the special characteristic of the brown Romagna race is the parting of very strong, thick bristles, running along the whole of the back. The York-Romagna cross-breeds mature more rapidly and are larger than the Romagna race. The former weigh when 20-22 months old as much as from 990 to 1045 lbs., the latter at 18-20 months only 550 to 660 lbs. The meat of the former, if without the excellence of the latter, is also without the defects of the pure Yorkshires. It keeps well, makes first-rate sansages, and has a fine marbling, taste, and consistence.

Pig breeding is very common among the peasants both on the *métairie* system and also for their own domestic use. The methods of feeding and fattening are as a rule rational and careful; on the other hand hygienic rules are but little regarded in the construction of the sties.

The pig trade in Romagna is very brisk: Faenza. Lugo, Ravenna, Forlì, Cesena and Rimini are the chief markets and exportation centres for the rest of Italy.

The following table gives the number of pigs forwarded in 1910 from the chief Stations of the district.

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* *Sull'Allevamento dei Suini nel Faentino* (Ravenna, 1910).

Faenza	51 141	(sucking pigs or pigs just weaned)
Forlì	17 081	(mostly fat)
Cesena	14 004	(ditto)
S. Arcangelo .	3 760	(fat.)
Savignano . .	813	(ditto)

OTHER LIVE-STOCK.

691

ATTINGER, Dr. **The Economic Importance of Rabbit-Breeding in Germany**. (Die wirtschaftliche Bedentung der Kaninchenzucht). *Landwirtschaftliches Jahrbuch für Bayern*, I. Jahrgang, No. 15, pp. 901-912. München, 1911.

Germany: Bavaria

The ever increasing scarcity of meat in Germany could be met by great attention being paid to rabbit-breeding, which has already developed considerably in France and Belgium, being practised, not only by farmers, but also by labourers and small tradesmen. Belgium sends ship-loads of rabbits to the London market. Australian wild rabbits in a frozen condition are also shipped in large numbers to London

In Germany, rabbit-breeding does not yet play so important a part for meat purpose, as hitherto it has been chiefly of a fancy nature; but now efforts are being made to suppress this kind of breeding. Since 1902, the ministry of the Interior has given subsidies for the holding of rabbit shows and markets, and also for procuring animals for breeding purposes. Only a few races are suitable for eating — Belgian and German *Riesen* (Giant) and French *Widder* (Ram).

These animals attain a live weight of 9 to 18 or even 22 lbs. As the doe throws 6 or more young at a time, and has 4 to 6 litters a year, the offspring of an adult rabbit represent a weight of 165 to 330 lbs. Rabbits can be fed on the vegetable refuse from the kitchen, so that their keep is not costly, and when all expenses are deducted, there is a good profit, or what is of more importance, meat for the household can be otained at small cost.

In nutritive properties, rabbit flesh is equal to other meat. It contains as much protein as beef 21 %, while in pork there is only 14 to 16 %.

To promote rabbit-breeding, the writer recommends that:

1. The edible races of rabbits should be increased.

2. Covering stations should be provided.
3. Model breeding-stations should be established.
4. Shows should be held for table-breeds, slaughtered rabbits, skins, models of hutches, etc., fancy breeds being excluded.
5. Depôts should be etablished for the Rabbit Breed societies for the sale of rabbits for the table.
6. Cooking classes should include in their curriculum the preparation of dishes made from rabbits.
7. A paper should be published dealing with rabbit-breeding.

POULTRY.

692 **Development of the Embryo Chick.** — *Poultry Advocate*, Toronto Ont. Vol. 13, No. 21, December, 1911, pp. 206, 207.

Canada

Twelve hours after incubation has begun, the ligaments of the head and body are discovered. Close observation has found the heart to beat by the close of the day. At the end of forty-eight hours two vesicles of blood are distinguished, the pulsations of which are visible. At the fiftieth hour, an auricle of the heart appears. At the end of seventy hours, the outlines of wings, and on the head two bubbles for the brain, one for the bill, and two others for the forepart and the hind part of the head appear. The liver appears toward the fifth day. At the end of one hundred and thirty-six hours, the first voluntary motion is observed. Seven hours later the lungs and stomach become visible, and the intestines, the loins and the upper jaw are seen at the end of one hundred and forty-eight hours. The seventh day, the brain, which is slimy, begins to have some consistence. At the one hundred and ninetieth hour of incubation the bill opens and the flesh appears on the breast Four hours after that the sternum is seen, that is to say, the breast bone. At the two hundred and tenth hour, the ribs come out of the back, the bill is visible, as well as the gall-bladder. The bill becomes green at the end of two hundred and thirty-six hours. About four hours later the feathers begin to shoot out, and the skull becomes gristly. The eyes appear at the two hundred and sixty-fourth hour; and at the two hundred and eighty-eighth hour the ribs are perfect. At the three hundred and thirty-first hour the spleen draws near to the stomach, and the lungs and the chest. At the end of three hundred and fifty-five hours, the bill frequently opens and shuts, and at the end of four hundred and fifty-one hours, or the eighteenth day, the first cry of the chick is heard.

PAECHTNER, J. Dr. med. vet. **Notes on Artificial Poultry Breeding.** (Beiträge zur künstlichen Geflügelzucht) — *Deutsche Landwirtschaftliche Presse*: 39. Jahrg. No. 12. pp. 126-127; No. 13. pp. 139-140. Berlin, 10. und 14. Februar, 1912. **698**

Germany

Dr. Paechtner has made a change in the Racine Incubator, by substituting a spirit for a petroleum lamp, in order to avoid the drawbacks of the latter; *viz.*, bad smell, and smoking.

A spirit flame burns in a tube which passes vertically through the water basin. From the latter the warm water flows in metal tubes beneath the eggs and then returns to its starting-point. The gases from the lamp pass upwards into a space lined with tin in the upper part of the incubator, over the eggs. The tin so heated adds some warmth to the incubator, and the gases escape at the further end of the space.

The temperature is regulated by means of a vulcanite stick inside the incubator, connected with a lever, whereby the flame can be increased or diminished.

The experiments with this apparatus were satisfactory. The cost of heating worked out at about ½*d* per chicken with the incubator only half full of eggs.

Dr. Paechtner has also succeeded in measuring the temperatures which obtain when the eggs are being hatched naturally. He constructed a tin egg, and placed in it three thermo-elements; the first, close to the top of the blunt end; the second, in the middle; and the third about 1 cm., or 0.4 in., from the pointed end. The rest of the egg was filled with aluminium powder and melted paraffin, whose specific warmth is about that of egg albumen.

This egg was placed among other real ones, under a hen and afterwards under a turkeyhen, and securely fastened. The thermo-elements were connected with the measuring instruments by conducting wires.

With the hen the tin egg showed temperatures of 38°-39° C. (100.4°-102.2° F.), and in the intervals, when she left the nest, the lowest temperature marked was 30.05° C. (86.09° F.). With the turkey-hen the temperature of the tin egg varied from 35.28° C. (95.5° F.) to 39.08° C. (102.34° F.), and twice, while she was away, the temperatures marked 21°.14° C. (70.05° F.) and 24.24° C. (75.63° F.).

The experiments showed also that the temperatures of hens' eggs, while the hen is sitting, depend on their position whether they are on the edge or in the middle of the nest; and that the hen makes constant efforts with her feet to change the position of the eggs. A transient lowering of the temperature down to 21° C. (69.8° F.) does no harm. All the fertilised eggs under the turkey-hen were hatched.

694 **Central Egg Depot for London.** — *The Dairy*, Vol. XXIV, No. 278, p. 49. London, February 17, 1912.

England Great Britain

The National Poultry Organisation Society has opened a central depôt for eggs in Hosier's Lane, West Smithfield.

For about a dozen years the society, which is a co-operative association run by farmers, has collected eggs from all parts of the country, and acted as a distributing agency between the farmers and retailers.

With the increase of business the establishment of a London clearing house was felt to be essential. The new building is equipped with all the latest appliances for testing and grading the eggs, and the system employed makes it practically impossible for the retailers to receive any suspicious qualities.

Its supplies are drawn chiefly from Cornwall, Devon, Somerset, Dorset, Hants, Oxford, Hereford, Norfolk, and North and South Wales.

695 EDWARDS, S. F. **Tuberculosis of Fowls.** *Bulletin No. 193, Ontario Agricultural College, Department of Agriculture*, Toronto, Canada, November, 1911.

Canada

This illustrated Bulletin of 20 pages has been prepared for the purpose of spreading information about the disease of tuberculosis in fowls and giving suggestions for its control.

Losses of fowls from the disease are said to be serious. One farmer is reported to have lost fifty fowls in seven months, each of two others had lost one hundred in two years.

The disease is known to affect chickens, ducks, geese, doves, canaries and parrots as well as many species of wild birds. It is known to be transmitted through eggs, but the disease is most commonly spread from bird to bird and from flock to flock through the medium of diseased birds scattering infected excreta.

By the aid of photo-engravings a clear and full description of ante-mortem and post-mortem symptoms of the disease are given. Ante-mortem sypmtoms are emaciation, paleness of the comb, etc. diarrhoea (occasionally) and lameness. The appetite remains good. Post-mortem appearances are yellow, rounded tubercles on the liver, spleen, intestinal system and lungs, and occasionally other organs and the bones. Clear instructions are given for conducting a post-mortem examination.

Curative treatment is discouraged. The quickest and most effective method of dealing with a diseased flock is said to be to kill off all the birds, disinfect the premises as thoroughly as possible and start with a new stock from a flock that is known to be free from disease. Eggs for hatching should be secured from stock that is known to be healthy. Chicks should be kept entirely separate from old fowls and only upon clean ground. It is further recommended that precautions be taken to prevent the possible infection of the fowls from bovine sources by the feeding of offal from slaughtered tubercular cattle or hogs, or from human sources by picking up sputum carelessly expectorated on the ground by consumptive persons. Explicit directions are given for the disinfection of poultry houses and yards.

BEES.

LEES, FREDERIC. **Apiculture in Algeria.** (L'Apiculture en Algérie). — *L'Apiculteur*, 56e Année, No. 2, pp. 42-49. Paris, Février 1912. **696**

Algeria is an ideal country for bee-keeping; the climate is excellent. On the coast the temperature very rarely falls below zero, while it varies in summer between 25° C and 35° C; there are many flowers and the bees can work nearly the whole year. **Algeria**

The districts of Algeria are not all, however, so well suited to this industry. The professional bee-keeper establishes himself, by preference, on the plains and in the valleys of the coast near the geraniums, the oranges, the eucalyptus groves and the thickets rich in heaths and rosemary. He avoids the vineyards and the cereal-regions.

The bees kept, in Algeria are of the common black variety, which is very prolific and swarms frequently. The natives use the most elementary apparatus.

The hive is made either of a piece of cork-oak bark 20 or 30 cm. (8 to 12 in.) in diameter and 1.20 m. (about 4 ft.) long, or of small frames made of little round pieces of fennel stalk, joined to each other by small rods of wood. The hives made of fennel are of the same dimensions as those made of cork-bark. In some places, hives are made of pottery and also of plaited straw rounded in the shape of a pear.

The swarms or hives bought from the natives cost from 2 to 5 fr. (1*s* 7*d* to 4*s*) in the Arab district, and from 5 to 10 fr. (4*s* to 8*s*) in Kabylia.

The honey is much prized by the natives, who prefer it to sugar, and attribute to it great medicinal virtues, it therefore fetches a high price in Algeria, 1.10 fr. per kilo (5*d* per lb.) wholesale, and 2 to 3 fr. (8 ½*d* to 1*s* per lb.) retail The colony also imports 459 700 kg. (452 tons) of honey, of which 127 043 kg. (125 tons) are for Algiers; the total amount imported is worth 354 000 fr. (£14 000).

The annual export of wax amounts to 168 quintals (329 cwt.) which is sold in Europe at 300 fr. per quintal (£6 per cwt.). There are in Algeria 1 132 European and 24 693 native bee-keepers who possess respectively 12 637 and 206 617 hives. The amount of honey gathered by the two classes of workers is 59 112 and 748 742 kg. (1 161 cwt and 14 707 cwt.) respectively, and that of wax 6 282 and 103 731 kg. (123 cwt. and 2 037 cwt.). The average production of a hive owned by a native varies, according to the district, from 2 to 5 kg. (4 ½ to 11 lbs), and a hive belonging to a European yields 10 kg. (22 lbs.). The native methods of taking the honey and of treating the bees are very primitive. The Governor General, with the help of the Algerian Society of Agriculture, is trying to improve the condition of this industry. Model hives have therefore been placed in various districts and entrusted to an instructor, an agent of the commune and also to a private individual. In the future, other hives will be established and entrusted to instructors who will give short courses of instruction in practical apiculture. These teachers will be instructed in the native section of the Normal School, when they will attend a short course on Apiculture, which will enable them in the future to manage, in a competent manner, a small hive belonging to the school where they may be afterwards employed.

LOVELL, J. H. **The Colour Sense of the Honey Bee. The Pollination of Green Flowers.** — *The American Naturalist*, Vol. XLVI, No. 542, pp. 83-107. New York, February 1912. **697**

United States

This interesting paper proves by means of a series of experiments, that Plateau's (1) hypothesis regarding the attraction possessed by green and dull-coloured flowers for insects is improbable. He considers that insects find such flowers as easily as they do more brilliantly coloured blossoms; and enumerates in support of his view 91 entomophilous species, of which 41 had greenish or brownish flowers. But of these, bees only visited 27, four were not visited at all and the rest chiefly by flies. A few instances occurred of greenish flowers being visited by a large number of insects, but this was due to the large secretion of nectar on the part of the former, but the majority of species are evidently not adapted to entomophily.

This conclusion is sustained by an examination of the green flowers of eastern North America; and in New Zealand, where the flora is strikingly deficient in brightly coloured blossoms, there is a scarcity of anthophilous insects; this is also due to the fact that the flowers are scentless, however.

The phylogenetic history of green flowers supports the view that they are not well adapted to pollination by insects; probably all greenish, inconspicuous flowers have been derived by retrogression from larger entomophilous ancestors, and inconspicuous flowers are almost invariably self-fertilising. Thus Plateau's conclusion is not sustained by the phylogeny and distribution, or by the ecology and manner of fertilization of such flowers. In the few exceptional cases, it is odour or nectar which attracts the insects.

Experiments were made to test the colour sense of the honey bee. It was found that the bees were attracted sooner by honey placed on a blue side, than on a green dandelion leaf; they also found honey associated with bright coloration sooner than free honey. A yellow flower and an apple leaf were also tried, but the bees were not even attracted by the scent of the honey on the leaf. Plateau put honey on the green inflorescences of several species of *chenopodium* and other anemophilous flowers, and asserted that the insect visitors were attracted by odour, and that colour contrast is of little value; it must however be noted, that he made no control experiments. These would have shown that, though the scent of the honey drew the insects to the green flower, the latter would have been at a disadvantage in the presence of brightly coloured blossoms. That odour alone does not attract bees, is well shown by an experiment, where the bees neglected a large mass of honey placed on a leaf and visible at a distance of 20 ft., but sought out a flower of *Impatiens Sultani* an inch in diameter, on which was a small amount of honey, notwithstanding that it was placed twelve inches from the honey on the leaf.

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(1) PLATEAU F. Comment les fleurs attirent les insectes, 4^{me} partie. *Bull. Acad. Roy Belgique*, 3^{me} Série, 34, 614-615. 1897.

Thus the conclusion that green flowers are at a disadvantage in attracting insects because of their colour was fully sustained by a long series of experiments. Black and Italian bees were used, and the observations extended over portions of three seasons.

If bees are guided by the sense of vision as well as by that of smell, their present and past relations to green flowers are not difficult to understand.

Conclusion.

Green flowers are not well adapted to entomophily, and many species, possibly all, have been derived by retrogression and degeneration from larger and more highly developed entomophilous forms. They are usually small, or even minute, and are often incomplete, while anemophily and autogamy prevail.

Entomophilous green flowers, are as a whole, sparingly visited by insects belonging to the less specialized families, and as a rule, retain the power of self-fertilization. The fact that insects have been observed feeding on over-ripe, or decaying fruit, on the glandular secretions of the vegetative organs of plants, or the excretions of aphididae on foliage or greenish or brownish flowers, affords no evidence that conspicuousness is not an advantage to entomophilous flowers. Any surface, whether it is bright or dull-coloured, on which there is nectar or honey will be freely visited by bees after these liquids have once been discovered, but they will not be found as quickly on a surface which does not contrast in hue with its surroundings, as on one which does so contrast.

Experiments and observations made on green or greenish flowers in the absence of control or comparative observations are fallacious. When honey bees are given the choice between a conspicuous and inconspicuous object under similar conditions, they exhibit a preference for the former. This preference is sufficiently marked to account for the development of colour contrast in flowers.

FISH.

698 **Berr-Bayersoien, Michael. Pike Breeding.** (Der Hecht und seine Zucht). — *Allgemeine Fischerei-Zeitung*, XXXVII Jahrg., No. 5, pp. 123-126. München, 1. März, 1912,

Germany

About 15 years ago the writer began to breed pike (*Esox lucius*) artificially, using the system employed for the *Salmonidae*. At first he was unsuccessful, partly in the process of "stripping" the eggs, partly because the fry when hatched devoured one another through want of food. The system he has now adopted as giving satisfactory results is as follows:

At spawning time, in March, the pike are caught, and put in small shallow spawning-pools well over-grown with grass The milters and spawners which were caught together are not to be separated i the pools. The spawning is finished in 2-3 days, and then the fish are removed from the pools, care being taken not to disturb the water, as otherwise the eggs might be injured. The eggs are hatched in from 10 to 16 days, according to the kind of weather. Twènty-four hours after hatching they feed on plankton, and on the fourth or fifth day they begin to prey on other creatures. If they find none, all the weaker fry perish. To prevent this, a sufficient amount of perch spawn is collected, and placed in the pike pools. Before this is all consumed, the pike fry must be removed and placed in rivers or ponds, preferably where the water is still and overgrown with grass.

699 **Thienemann, August. Pisciculture in the Reservoirs formed by Barrages in the Valleys of Western Westphalia.** (Hydrobiologische u. fischereiliche Untersuchungen an den Westfälischen Talsperren). - - *Landwirtschaftliche Jahrbücher*, XLI. Bd., Heft 3-4, pp. 535-716. Berlin, 1911.

Germany

The Wetphalian reservoirs are formed by the barrage of brooks in which *Salmonidae* live. The capacity of these reservoirs lies between 0.45 to 130 million cub. metres (0.58 to 169 million cub. yards). They have been made either for regulating the flow of the water, or to provide towns with drinking water, or for the production of electrical power, and in some cases for two or all three of the above purposes.

Their utilization as fish ponds is a secondary consideration. From this point of view a barrage reservoir differs greatly from a lake in that its water-level is subject to very considerable changes. Besides which, it never forms that area of shallow water, such as is produced near the shore of a lake by the erosive action of the waves always acting at the same level. The flora and fauna of the shallows of a lake, which afford such an important supply of food for the fish, appear only to a very limited extent in reservoirs.

The considerable changes in the water level, on the other hand, which leave every year a large portion of the bottom exposed to the action of the air, heat. rain etc., and thus allow the growth of land plants upon it, produce, when the water level rises again, such a quantity of food for the fish, as to counterbalance the want of a permanent shallow zone.

The reservoir water, in summer, gets warmer, and to a greater depth, than lake water; this is due to the constant outflow from the lower and colder part of the reservoir, which causes the gradual sinking of the upper and warmer layers of water. The Author in September 1910 observed, in a reservoir, a temperature of 14.1° C. (57.4° F.) at a depth of 19 metres (62 feet) and at the same time in one of the crater lakes in the Eiffel only 6.1° C. (43° F.) at a depth of 20 metres (65 feet).

The principal food of the reservoir fish is furnished by larvae of the *Tendipes* species, which live in reservoirs in great numbers, far superior to those of any other species. In some reservoirs many *Daphnidae* also are found.

The amount of fish taken in these reservoirs has been hitherto rather low, about 2 to 14 lb. per year and per acre of surface. The cause of this is not that the fish do not find favourable conditions of life in the reservoirs, but that the difficulties of fishing are considerable. According to the Author the only remedy would consist in fishing as it is practised in lakes, and especially in the adoption of drag-nets. Wherever they have been tried they have given good results, but they can only be used where the bottom of the reservoir is fairly even, free from rocks, or snags etc.

The author therefore strongly recommends, that during the construction of the reservoir certain portions of its bottom should be freed from all obstacles which might prevent the use of drag-nets. These spots should be marked so as to be easily recognized by the fishermen.

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS.

ROSE, PHILIP S **The Motor in the Field.** *The Country Gentleman,* Vol. LXXVII, No. 5, pp. 2-3 and 27-28. Philadelphia, February 3, 1912. **700**

United States

There are over 6 000 000 farms in the United States at present, of which 1 151 488 contain more than 175 acres each. Of this number 17 487 contain more than 500 acres.

There are at least 500 000 farms that contain 320 acres and more. Each of these is large enough to find it economical to use a tractor instead of horses. The number of traction ploughing engines in active operation in the United States is estimated at about 30 000.

There are 477 488 800 acres of improved land in the United States, which require at least 40 000 million horse power hours of work. To accomplish this work there are kept about 22 million adult horses and mules.

The annual expense for each animal is not less than $ 65 a head, or a total of about $ 1 400 million dollars annually. These animals consume the crops grown on approximately one hundred million acres of land, representing more than 20 % of the cultivated land of the nation.

By the wide-spread use of mechanical power a large part of this one hundred million acres could be turned to the production of human food.

Recent statistics show that the cost of horse labour is about eight cents an hour and man labour about eleven cents. A horse can perform on an average about eight-tenths of a horse-power of work. The cost of a horse-power hour is therefore ten cents.

A man can do one-eighth of a horse-power of work and consequently a man's labour costs eighty cents per horse-power hour. A good gas tractor, on the other hand, with fuel at 20 cents a gallon will deliver a horse-power hour for from two to two and a half cents. On this showing it would appear that the argument is all in favour of mechanical power.

Recently, near Beach, North Dakota, two thousand acres of raw prairie were broken, and seeded to flax, the crop harvested and hauled to market, all with a gas tractor. The farmer cleared $ 28 000 for his season's work after paying all expenses, which, including the cost of equipment, amounted to only $ 5.50 an acre, whilst, according to accurate data for a number of years, in the state of Minnesota, the cost of production of flax by horse farming ranges from $ 6.14 to $ 9.26 an acre on old well-tilled land.

In Minnesota Mr. James Hardy investigated the fuel cost of ploughing, disking, seeding and threshing. He broke 240 acres of sod last year and ploughed 1 685 acres of stubble land, using two and a half gallons of kerosene an acre, which cost him 8.7 cents a gallon. He also threshed for fourteen days and his best run was 3 700 bushels. When threshing he used 45 gals. of kerosene per day.

Mr. Hardy also used his tractor for a considerable amount of general road work, but gave no figures on the cost of such work.

In Kansas, Mr. M. W. Oliphant who farms 1 400 acres of land, ploughed it all at the rate of 46 acres a day with a steam ploughing outfit. It required 3 500 pounds of fuel a day, worth $ 3.30 a ton. His engine hauled twenty-one disk ploughs, cutting a strip eighteen feet six inches wide to a depth of six inches. The cost of this work, including fuel and labour but not counting interest or depreciation, amounted to only thirty-five cents an acre.

The Judith Basin (Montana) five years ago was a cattle breeding country; now, thanks to engine farming the land is worth from $ 25 to $ 75 an acre. Throughout Western Canada we find similar conditions and it is largely due to the farm tractor that the three western provinces increased their annual production of wheat from 23 456 000 to 180 000 000 bushels in the last decade.

The gas tractor is superseding the steam tractor because it is lighter in weight, easier to handle, requires fewer men and as a rule is cheaper to operate. By using two crews the farmer can work his engine twenty four hours a day, a practice which is not at all uncommon on large grain farms in the West.

RINGELMANN, MAX. **The Watering of Manure.** (L'arrosage du fumier). — *Journal d'Agriculture pratique*, 76e Année, T. I, No. 6, pp. 179-182. Paris, 8 Février 1912. **701**

In the preparation of good farmyard manure frequent waterings with liquid manure are necessary.

France

This wetting reawakens the fermentation, favours the development of bacteria, and prevents the loss of carbonate of ammonia.

The liquid manure must be lifted to about three feet above the level of the top of the dung heap, and thence distributed on it by sprinkling. This can be done in three ways:

1st method. – By means of chutes consisting of two boards joined, at right angles to each other, so as to form a channel having a V-shaped cross-section. Under the lower end of the chutes some faggots are laid on the dungheap; one man is sufficient to attend to the work. Every ten minutes or so, he stops the pump, and shifts the position of the lower end of the chutes, which are supported on light wooden trestles shaped like an X or an H.

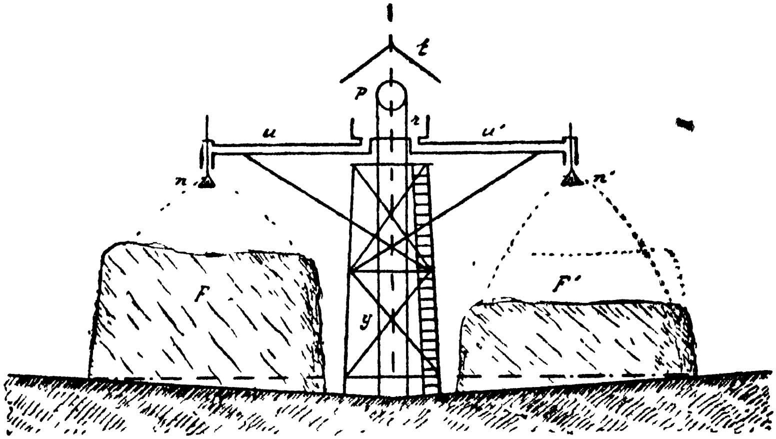
The following arrangement may also be adopted. The liquid manure is raised to a point above the centre of the heap and thence flows into a single chute, the boards of which are pierced by numerous holes. The end further from the centre is borne by a trestle mounted on two small wheels so that it can describe a circle round the centre. A screw allows this end to be raised or lowered in order to give the liquid manure more or less fall. The whole system, pump and chute, may be worked by a motor.

2nd method. — Between the two heaps *F* and *F*¹ (fig. 1), on a pillar of a convenient height, a chain pump *P* is placed; it raises the liquid manure and pours it into two pipes *u* and *u*¹ which convey it over the centres of the heaps. The pipes are fitted with taps or with conical wooden plugs sheathed with leather and their outflow is situated over grooved distributing cones *n*, *n'* which can be raised or lowered so as to be at least 6 ft. 6 in. above the heap when used. A roof *t* shelters the pump and its reservoir *r*.

3rd method. — An interesting installation has recently been made by M. Lazard at his farm at Moisan (Seine-et-Oise). The general arrangement in shown in fig. 1. But the cones *n* and *n'* are substituted by cast iron basins revolving round an axis borne by the frame work of a shed which shelters the whole installation. From each of these basins the liquid manure flows into a perforated chute, the further extremity of which is borne by a small truck running on a circular rail fixed at a convenient height to the shed timbers. The whole is worked by an electrical 2 ½ H. P. motor.

The above mentioned installations may be utilized when it is required to produce an extra quantity of manure by frequently treating straw, sawdust, potato haulms, earth, etc., with concentrated liquid manure.

The use of a hydraulic tourniquet or Barker's mill in the centre of the dung-heap, and connected with the pump by India rubber hose is not to be recommended, as it is liable to frequent obstruction by the solid matter held in suspension by the liquid (1).



708 **Berger. A New Separator.** (Une nouvelle écrémeuse): — *L'Outillage agricole*, II série, No. 1, pp. 183-184. Enghien, Janvier, 1912.

A new separator is the " Dalia " of the Alpha Laval type (2). Its novel features are the following:

France 1. *Oil bath.* — This is complete for all the rapidly moving parts; it is so arranged as to require a minimum of care while ensuring the greatest regularity of lubrification.

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(1) See *B.* Feb. 1912, No. 387. (*Ed.*).

(2) The " Alpha-Laval " separator was invented in 1878 by the Swedish engineer Laval; it was improved in 1889 by Bechtolsheim. At present the hand-worked sizes separate from 60 to 600 litres (13 2 to 132 gals) per hour. Motor driven sizes separate from 700 to 2000 litres (154 to 440 gals). There is also a type worked directly by steam, called the turbine separator which turns out 300 to 2000 litres (66 to 440 gals) per hour. See Ch. Martin, *Laiterie, Encyclopédie agricole*, pp. 124-128. Paris 1908. (*Ed.*).

The clutch of the handle. — The ratchet of the clutch is on the worm wheel shaft. The result is that this shaft, its pinion, the driving wheel, the crank and its shaft stand still while the bowl finishes its rotation at the end of the operation.

3. *The bowl.* This is the new Alpha bowl with some important modifications:

a) The device for removing the disks not only allows this to be done very easily, but it leaves the last disk free, without any danger of its falling out of place when the whole is placed on the table.

b) In all known separators the cream on leaving the bowl is projected in a direct stream against a metallic surface which causes a division of the fat globules. Cream thus obtained offers a greater resistance to churning. In the new machine, the cream outlet is pierced in the side of the bowl, but its direction is oblique to the radius of the latter, and turned backwards, so that the cream cannot strike the metal surface except at a tangent. This is the most important improvement in the machine.

The other improvements render the whole separator more solid, make it easier to work and give the cream a greater uniformity of composition.

RURAL ECONOMICS.

Tenant Farmers and Changes in the Ownership of their Holdings, in England and Wales. — *The Journal of the Board of Agriculture*, Vol. XVII, No. 11, pp. 921-926. London, February 1912. 708

The Departmental Committee appointed by the President of the Board of Agriculture and Fisheries in March 1911, to inquire into the position of tenant farmers, in England and Wales, on the occasion of any change in the ownership of their holdings,— whether by reason of the death of the landlord, the sale of land or otherwise,—has presented its report.

Great Britain England

Estates on the Market. The Committee state that there is no doubt that an abnormal number of estates are being broken up and sold at the present time. In 1911 the value of the agricultural land sold exceeded two million pounds. Among the causes to which this sale of estates was ascribed by the Committee are: 1. The feeling of apprehension among landowners as to the probable tendency of legislation and taxation in regard to land.

2. The fact that in certain parts of the country land is, at present, let at rents below its present economic value.

3. Many agricultural estates are mortgaged more or less heavily, and, at present prices, a sale will often enable the vendor to pay off the mortgages and to retain an income in excess of what he has been receiving as owner of the land.

4. Many owners finding they are now in a position to sell to advantage, are relieving themselves of the heavy responsibilities entailed by the ownership of land.

Position of tenant Farmers on Occasion of Sale. Great anxiety exists among tenant farmers as regards the sale of the estates, and this feeling of insecurity is militating against agriculture.

The Committee make therefore the following recommendations:

1. At present the tenant is under an obligation to give notice in writing of his intention to claim compensation, within two months of his receiving notice to quit, or being refused a renewal of the tenancy. The Committee are of opinion that the landlord would be sufficiently safeguarded, if the tenant were allowed to give notice of his intention to claim, at any time up to a date two months before the determination of the tenancy.

2. That for the determination of the tenancy of an agricultural holding, in absence of agreement, two years' notice should be substituted for the one years' notice.

3. That, except when notice to quit is given for one of the purposes referred to in Section 23 of the Agricultural Holdings Act, 1908, or where the tenancy is for a period of twelve months or less, any agreement for notice to quit for less than twelve months should be made void by statute.

4. That, in cases where a tenant receives notice to quit for the purpose of sale, the tenant should be empowered to serve a counter notice, claiming that the notice to quit shall not take effect, until one year after the original notice would have expired. The Committee think that a tenant would thus be given time to negotiate with his new landlord, or to make arrangements for obtaining another farm, and that this would go far towards removing any grievance under which the tenant labours at present.

5. That the Small Holdings Act 1910 should be amended to provide for payment of compensation for disturbance, in all cases

where land is actually acquired for small holdings in addition to those cases where the tenancy is determined by a notice to quit given by the council or by a landlord at the request of the council.

6) That if special legislation be enacted for Wales, effect should be given to certain recommendations of the Welsh Land Commission as to compensation for improvements.

7. State-Aided Purchase. That a scheme of State-aided purchase should be instituted providing for the establishment of a Land Bank or Institution to lend money to the farmer, to enable him to purchase his holding. The institution should lend to the farmer four-fifths of the money, to be repaid by annual instalments spread over a period of 75 years.

8. State Purchase. In view of the experience of the Small Holdings Act and the strong desire which undoubtedly exists amongst farmers that they should remain tenants, the Committee are of opinion that landed estates should be purchased and managed by the State, the farmers in this case being the tenants of the State.

RITTER. **Consultations on the Management of Estates Undertaken by the "Deutsche Landwirtschafts-Gesellschaft".** (Ein Rückblick auf die bisherige Wirtschaftsberatungen der D. L. G.). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Stück 6. Berlin, 10. Februar 1912. **704**

Germany

Consultations on the management of estates have formed part of the work of the Deutsche Landwirtschafts-Gesellschaft since 1900, but a special Board for this purpose has only been in existence for the last six years.

From 1900 to 1911 there were 146 consultations, and of this number 105, or 72 %, were applications from people personally managing their property.

The following table shows the average cost of consultation for 105 estates where the full charges were paid.

(a) *I Period. 1900-1905.*

Classes according to size, acres	Number of estates	Total area acres	Total cost. £	s	d.	Cost per acre s.	d
Up to 250	3	525	31	6	2	1	2 3/4
250 to 500	4	1 413	30	9	3	0	5 ½
500 to 1000	7	4 581	62	19	6	0	3 ½
1000 to 1500	2	2 039	19	14	9	0	2 ½
1500 to 2000	3	5 174	51	15	3	0	2 ½
2000 to 2500	3	6 807	57	7	9	0	2
Above 2500	3	13 025	48	13	6	0	1
Totals and averages .	25	33 565	302	6	2	0	2

(b) *II Period, 1906-1911.*

Up to 250	2	210	13 14 0	1 4
250 to 500	17	6 352	164 0 9	0 6 1/4
500 to 1000	22	15 613	305 0 4	0 5
1000 to 1500	13	15 119	218 4 6	0 3 3/4
1500 to 2000	9	15 571	137 3 3	0 2 1/4
2000 to 2500	7	15 215	136 16 0	0 2 1/4
Above 2500	10	47 675	315 16 9	0 1 1/2
Totals and averages .	80	115 758	1290 15 7	0 2 3/4

For the whole 12 years 1900-1911 the average cost per acre works out at 2.37d. for a total area of 149 324 acres.

The Deutsche Landwirtschafts-Gesellschaft counts 18 000 members, and in comparison the number of consultations may seem small. The second period however shows a marked increase in acreage over the first. This shows that farmers are beginning to understand the value of a critical study of estate management drawn up by technical experts.

Mr. Ritter suggests that the most effective means of making known the work of the consultation board would be the figures indicating the returns obtained on those estates (without mentioning any names), where changes in management were carried out in accordance with the consultations that were applied for. To make this feasible, however, the Board would have to exercise a certain control over the consultation and its results

The accounts of a farm with distillery attached showed for the year 1906-7 a net loss of 1s. 2 1/2*d.* per acre. Changes were made according to the advice of an expert, with the result that for the year 1910-11 the net profit per acre was 12*s* 1 1/2*d.* The chief changes were those relating to draught and other cattle, the division of the poorer soil from the richer, with two different rotations, and the choice and application of chemical fertilisers.

705 VIGIANI D. **The Production of Seeds, from the Economical Point of View.** Paper read at the ordinary meeting of Feb. 4, 1912 of the Academy of the Georgofili. (La produzione dei semi considerata dal lato economico. Comunicazione fatta all'Accademia dei Georgofili nell'adunanza ordinaria del 4 Febbraio 1912). — *L'Agricoltura italiana*; Pisa, 29 Febbraio 1912.

Italy

The Author gives some data on the profit which may be obtained by the production of seed wheat and of clover seeds, taking as a basis the results afforded by the Capezzine Estate belonging tothe Vegni

Agricultural Institute, Prov. of Arezzo where for the last ten years and more several hundred quintals of seed wheat is produced every year.

At the Vegni Institute, the system of *systematic selection* is the one adopted, as being, industrially, the most suitable for an agricultural exploitation. The various operations have been carried out as follows, for a good many years: Before the harvest, selection is made of some of the best wheat plants, namely those having all the typical characters of the varieties cultivated. All the morphological characters, even the apparently least important, are subjected to careful examination: tillering, development and structure of the straw, length and appearance of the ear, of the paleae and glumes, form, structure, color, volume and weight of the caryopses. Due consideration is also given to resistance to disease and to lodging.

The grains from the central part of each ear are sown in small plots by means of special boards fitted with pegs at equal distances from each other. The plants thus obtained are, again, in the following year, selected according to the same criteria. The seed thus obtained is sown in a special plot in which the wheat is further selected removing all those plants which do not show clearly all the characters of the variety to which they belong, or which reveal signs of degeneration or sickliness.

The seeds from this plot are sown in the school farm (in which selection continues), which in its turn provides the seed wheat for all the farms of the " Capezzine " estate.

The mechanical selection is carried out on the physiologically selected wheat by means of winnowing and other machines that remove the vetches and other seeds and impurities, and grade the wheat according to its density, and lastly it is selected by hand, this last operation, especially in certain years, having been found extremely useful.

The cost of the mechanical selection of 100 hectolitres (275 bushels), weighing 7,600 kg. (144.4 cwt), at 23 fr. per hecto (6*s* 7 $^{3}/_{4}$*d.* per bushel) worth 2300 (fr. £91.5*s* 4 $^{3}/_{4}$*d.*) was the following:

	Fr.	£ *s.* *d.*
a) Winnowing	3.33	(0. 2 7 $^{3}/_{4}$)
b) Freeing from vetches	6.00	(0. 4 9 $^{1}/_{4}$)
c) Grading	5.00	(0. 3 11 $^{1}/_{2}$)
d) Hand selection (not necessary every year, nor for all the wheat	102.00	(4. 0 11 $^{1}/_{2}$)
e) Amortisement of machines	9.00	(0. 7 1 $^{3}/_{4}$)
Total Expense . . .	125.33	(4.19. 5 $^{3}/_{4}$)

Products.

	Fr.	£ s d
a) Seed wheat 91.66 hectolitres (252. bushels) weighing 7066 kg (134.25 cwt.) at 33 fr. per hectolitre (9*s* 6*d* per bushel)	3024.78	(120. 0 7 ½)
b) Vetches 3.50 hecto. (9.63 bush.) or 233 kg. (4.43 cwt.) at 6 fr. per hecto. (1*s* 8 $^3/_4$*d*) per bushel	21.00	(0 16 8)
c) Small wheat 2.50 hecto. (6.88 bush.) or 150 kg. (2.85 cwt.) at 14 fr. per hecto. (4*s* 9 ½*d* per bush.)	35.00	(1 7 9 $^1/_4$)
d) Offal for poultry 1.67 hecto. (4 59 bush.) or 105 kg. (1.1 cwt.) at 6 fr. per hecto (1*s* 8 $^3/_4$*d* per bush.)	10.02	(0 7.11 ½)
e) Impurities 0.67 hecto (1 84 bush) . . .	—	—
Total value of products . . .	3090.80	(122.13. 0 $^1/$)
Expense to be deducted . . .	125.33	(4.19. 5 $^3/_4$)
Net value of products . . .	2965.47	(117.13. 6 ½)
Value of 100 hectos of wheat before selection	2300 00	(21. 5. 4 $^3/_4$)
Profit on 100 hecto. (275 bushels) . .	66 47	(26.5 8. 1 $^3/_4$)

This profit of 6.65 fr. per hecto. (1s. 11*d*. per bushel) represents the cost of the physiological selection, and the industrial profit.

The profit on the production of clover seed is given by the difference between the value of the hay lost in the second mowing and the value of the seed, minus the necessary expenses.

The experiments made by the author on this subject were carried out in 1906-1909 and 1911.

Yield per hectare (2.47 acres)	1906		1909		1911		average	
—	Kg.	cwt.	Kg.	cwt.	Kg.	cwt.	Kg.	cwt.
Seeded hay and husks .	2260	42.94	2500	47.50	2400	45.60	2386	45 33
1st. crop hay	3090	58.71	3000	57.00	3400	64.60	3363	63.90
2nd. crop (lost in the plots in which the seed is harvested)	2715	51 51	3500	66.50	2800	53.20	3005	57.10
Seed , ...	350	6 65	400	7 60	360	6 84	370	7.03

The cost of production (*C. p*) of one quintal (1.968 cwt.) of clover seed is given by the following formula

$$C\ p = \frac{F - S + s}{P}$$

in which *F* represents the value of the hay lost on the second crop left for the production of seed ; *S* the value of the seeded hay and husks ;

s the cost of threshing, cleaning and storing the seed, and *P* the number of quintals (1.968 cwt.) of seed yielded by one hectare (2.47 acres).

And as the average price of clover hay is 9 fr. per quintal (3*s* 7 ½*d* per cwt.), of the hay made after seeding 4 fr. per ql. (1*s* 7 ¼*d* per cwt.), and the cost of threshing etc. is 12 fr. per ql. (4*s* 10*d* per cwt.) of seed, we get:

$$\text{C. p.} = \frac{270{,}45 - 95{,}44 + 44{,}40}{3{,}70} = 59.30 \text{ per ql. or } 23s\ 11d \text{ per cwt.;}$$

so that as long as clover seed commands the high prices that it does now, namely 120 to 180 fr. per quintal (48*s* 5*d* to 72*s* 7 ½ *d* per cwt.) its production will continue to be highly remunerative.

Though the above data (which represent only a small part of a work not yet wholly completed) are not sufficient to allow of general conclusions being drawn, they point clearly to the benefits to be derived from selection in the seed industry.

MINKLER, FREDERICK C. **Cost of producing Milk at the College Farm of the New-Jersey State Agricultural College and Experiment Station.** — *Thirty-first Annual Report of the New-Jersey State Agr. Experiment Station.* 1 Vol., pp. XV + 424. *Report of the Animal Husbandman,* pp. 51-67. Paterson, N. J., 1911. **706**

The increased cost of all feed stuffs as well as labor makes the problem of profitable milk production an important one for farmers and dairymen.

United States: New Jersey

Even the value of good cows has increased 20 per cent during the last two years, despite the fact that the price of milk has not kept pace. Accurate records of the amount of feed consumed by the College Farm dairy herd were kept during the past year and are given in detail below. Tvo sets of calculations are given, one basing the cost of producing milk on the actual cost of growing and harvesting the forage, roughage and ensilage, with the grain mixture charged at car lot prices; the other calculation being based on market prices of the products.

The herd, consisting of 31 head of mostly grade cows of the four breeds Holstein, Jersey, Guernsey and Ayrshire, consumed during the year the following amounts of feed and roughage:

	Amount in Tons.	Actual Cost Growing and Harvesting per Ton.	Total Cost
Green Forage	142.25	$2.98	$383.12
Mixed Hay	21 78	4.82	104.97
Oats and Pea Hay . .	2.32	4.94	11.46
Alfalfa Hay	12.00	5.34	64.08
Corn Stover	19.00	4.00	76.00
Ensilage	172.00	3.51	603.72
Beet Pulp	10.5	23.00	241.50
Mixed grain made up as follows:			1 487.43
	Total . . .		$2 972.28

	Pounds	Per Ton.	Total Cost
Distillers' Grains . . .	72 800	$30.00	$1 092.00
Wheat Bran	35 700	27.00	475.20
Oil Meal	18 100	35.00	316.75
	126 600	$30.00	$1 883.95
Less amount fed to bulls and young stock . .	23 475	30.00	396.52
	103 125		$1 487.43

	$
Average cost per cow per year for feed alone	95.73
» » per day for feed alone	0.262
» » per quart of milk	0.024

Placing market valuations on the home grown products and considering four tons of forage equivalent to one ton of hay, the value of the feed consumed was as follows:

	Amount in Tons.	Market Value per Ton.	Total Value
Green forage equivalent to hay	35.65	$12.00	$427.32
Mixed Hay	21.78	15.00	326.75
Oats and Pea Hay	2.32	15.00	34.80
Alfalfa Hay.	12.00	20.00	240.00
Corn Stover	19 00	8,00	152.00
Ensilage	172.00	5.00	860.00
Beet Pulp (car lots)	10.5	23.00	241.50
Mixed Grain (car lots)	51.31	30.00	1 487.43
Total of feed consumed . . .			$3 769.80

	$
Average value of feed consumed per cow per year	121.60
» » » » » » per day	0.333
» » » » » quart of milk	0.0304

Labor and Expenses.

The following charges are based on actual cost of labor and do not include supervision:

	$
Labor (one man for 12 cows) at $1.50 per day	1 332,00
Bedding (one bale shavings for 20 cows per day)	164.80
Stabling ($5 per cow per year)	155.00
Interest (31 cows at $100 each at 5 %)	155.00
Depreciation in value of cows at 10 %	310.00
Bull $200 at 5 % = $10; cost of keep $50	60.00
Total cost of labor, bedding, etc. 31 head	$2 176.80

	$
Average cost for labor etc. per cow per year	70.22
» » » » » » per day	0.192
» » » » per quart of milk	0.0176

The charge of $5 per year per cow for stabling covers the extra cost for the stable construction necessary in producing high grade market milk.

Further than this no charge is made for the investment in the farm itself or the dairy buildings, nor for dairy apparatus, milk utensils, incidental expenses, or insurance.

Based on actual cost of growing and harvesting products consumed and of labor, the total cost for feed, labor, etc. for the year was per cow $165.95; based on market valuation of feed consumed, $191.82. The yield of 31 cows averaging 8 661 lbs. of 3.96 % milk, the total cost per quart of milk will be in the first case $0.0416, in the second case $0.0480. No credit, however, is given the cow for the manure voided or the calf produced, neither is the farmer's time charged for. Calculating the manure worth $20 per cow, and the grade calves $6.00 each at five days old, the cost of producing 4 % milk even with the high yields reported, and not including cost of supervision, was approximately 4 cts. per quart.

There is a marked difference between the income from the various cows when comparism is made by grouping the grades and pure breds of each breed together, and classifying the herd on this basis. The following table identifies the herd by breeds and gives the actual amount of milk, butter fat and estimated butter, together with the income per cow at the price received for College Farm milk at the farm, in cans:

Comparison of Yields and Income by Breeds.

Breed —	No. of cows —	Average yield of milk — lbs.	Average test for fat — %	Average yield of butter fat lbs.	Average yield of estimated butter lbs.	Average yield of milk per day (365) lbs.	Average number of days in milk	Value of milk at 6 c. per quart
Holstein	16	9 724.2	3.43	333.91	389.56	26.6	284	$ 271.88
Jersey	7	7 978	5.17	411.84	480.48	21.9	293	223.06
Guernsey	4	5 822	4.85	282.42	329.49	15.9	212	162.78
Ayrshire	4	8 630	3.72	321.43	375.00	23.6	270	241.30

The above is significant, showing that regardless of breeds there is, at 6 c. a quart for the milk, a clear profit in dairying when first class animals are maintained in the herd. The Holsteins rank first in lbs. of milk, while the Jerseys, as shown by the following table, outclass all others from a standpoint of butter production.

Comparison of Yields and Income on a basis of 4 % butter fat.

Breed —	No. of cows —	Average yield of milk lbs.	Fat %	Equivalent to 4 % milk — lbs.	Income per cow on 4 % fat basis at 6 cents per quart — $
Holsteins	16	9 724.2	3.43	8 348	233.41
Jerseys	7	7 978	5.17	10 296	287.87
Guernseys	4	5 822	4.85	7 061	197.42
Ayrshires	4	8 630.3	3.72	8 036	224.68

The Jerseys show a good margin from a butter fat basis, while the Guernseys are unusually low since three of the cows were farrow for several months owing to the fact that the bull used was not a sure breeder. The average weight per cow of these 31 head was 1 231 lbs.

707 Canada

Profit on Steer Fattening in the Open in N. W. Canada. — See above No. 681.

708

Prizes for Book-keeping by small Farmers in East Prussia. (Buchführungsprämien für Kleingrundbesitzer). — *Georgine*. Königsberg, 2. März 1912.

Germany: East Prussia

The East Prussian Agricultural Chamber is arranging for the distribution of prizes with the object of encouraging book-keeping in small farms.

For these prizes only small land-owners or members of their families who personally keep their farm accounts may compete, and their books, regularly kept, must cover at least one whole agricultural year and consist of the following accounts:

1. Cash account in which every single item of receipt and expenditure in money must be entered. These items must, where possible, be divided into two classes, that is: one concerning the farm and the other the farmer's private account.

2. Family account, in which everything in kind taken by the family from the farm, must be duly entered.

3. Inventory book, or account showing the value of the farm buildings, of the live stock, machines and implements, and the remaining dead stock.

4. Profit and loss account.

The total amount available for prizes is 400 marks (about £ 20). A special commission composed of members of the financial and accountants'section of the Chamber of Agriculture will award the prizes.

It is understood that the economical data concerning the single competitors, thus laid before the judges, will be considered strictly confidential.

No entry for this competition will be allowed after the 1st of April and the account books are to be handed in between the 1st and 15th of July 1912.

710 ZEEB. **Kuchler's Patent Hygienic System for Distributing Milk.** (Das hygienische Patent-Kuchler-Milchausschank-System).—*Deutsche Schlacht-und Viehhof-Zeitung*, 12 Jahrg., Nr. 8, pp. 112-113. Berlin, 25. Februar 1912.

Germany

Patent milk-carts are now used in Munich for the distribution of milk. These have the following advantages: 1) they prevent the milk being adulterated, after it is put in the cans; 2) they prevent a partial rising of the cream to the surface, if the milk stands for some time; 3) they prevent all contamination when the milk is being poured out.

The cart has four divisions. with two cans containing 400 litres (88 galls.) each, and two containing 100 litres (22 galls.) each; so that it holds altogether 1000 litres (220 galls.) The cans can be taken out of the cart, though this is not necessary, for filling and other ordinary operations. To each can is attached a strong, officially graduated, glass, for measuring out the milk. The buyer's milk-jug is placed under this apparatus on a moveable plate, which when not in use is pressed against the former by a spring. Therefore, before a jug can be placed on it, it must be pressed downwards. This is affected by a lever which is connected with a stirrer inside the can. The milk is thus throughly stirred up, before any of it can be drawn. The plate with the jug on it is then pressed upwards by the spring against a second plate, which is fastened to the bottom of the graduated glass, and in the middle of which is the opening for letting out the milk. Any desired quantity can then be obtained. It passes first from the can into the measuring glass, and then through the opening in the bottom of the latter into the jug. The whole process is exceedingly hygienic, and there can be no contamination from dust or dirty hands. Neither can the milk be watered, as after the cans are filled they are sealed with lead. The cans, measuring glass, and all other parts can be cleaned without difficulty.

Samples of milk taken at different times from the cans have shown on analysis almost the same content in fat, proving that the stirrer answers its purpose. Ice in summer, and a small acetylene apparatus in winter equalise the temperature inside the cart.

The Kuchler Company also constructs refrigerators on the same principle as the milk carts. They are intended for shops, and the average temperature maintained is 8° C. (46.4° F.).

711

PETERSSON, ERNST; SADLER, JAMES; and FETLICK, OTTO. **Milk Standards.** — *Schweizerische Milchzeituug*, 35. Jahrg. Nos. 10, 11 and 12. Schaffhausen, 2. 6. and 9. Feb. 1912. — *The Farmer and Stockbreeder*, Vol. XXV, No. 1170, p. 368 London, Feb. 26, 1912. — *Molkerei-Zeitung*, 22. Jahrg., Nos. 5 and 6, pp. 51-52 and pp. 62-64. Berlin, 3 and 10 Feb. 1912.

Germany. Great Britain. Switzerland

The fat content of milk is not more important than its other constituents and the authorities are mistaken if they estimate its value as a food-stuff solely by the former. If a minimum limit of fat content and of the specific weight be fixed, adulteration is encouraged. If the standard be put too high, perfectly normal milk may be excluded from sale. Therefore no fixed standard should be laid down, and (according to Sadler) " all the milk which a cow has given at any time must be considered as whole milk ".

To judge of milk properly all its constituents must be taken into consideration; and an excellent system has been introduced in Swedish dairies since 1908. Several dairies (5 to 8) form an association, and appoint a dairy specialist. The latter tests their milk for its fat content (by Lindström's system) three or four times every month. He also judges of its taste and smell, determining its dirt content by the " Record " method and by Barthel's reductase tests. The milk cans are also inspected. The milk is divided into three or four classes according to the specialist's report. Thus:

1) High grade milk.
2) Second » »
3) Third » »
4) Bad milk, unfit for use.

The decision of the expert fixes the tariff of charges. The price of the high grade milk is determined according to the price of butter for the time being and according to its fat content. This is the standard, and from it a reduction is made, varying from 0.55*d* to 2.81*d* per gallon, for second and third grade milk. Milk of the fourth class is usually rejected.

In Sweden there are now 58 dairies belonging to such associations, and many carry out this system independently. The percentage of milk belonging to Classes II and III was at first considerable, and a good deal also belonged to Class IV. There is however, among farmers, a tendency to improve the quality of milk and this tendency is encouraged by the higher price which is paid for a higher grade of milk.

712 DEAN H. H. **System of Valuing Milk for Cheese Making.** — *Farm and Dairy*, Peterboro, Ont., Vol. 30, No. 50, December 14, 1911, pp. 3-6-9.

Canada

The basis of settlement among patrons of cheese factories, after paying for the cost of manufacturing, selling and other legitimate expenses, must include the following points: 1. It must be fair and just to all concerned. 2. It should be inexpensive. 3. It must be applicable to factory conditions and suit the needs of the people. 4. It must be supported by a majority of the patrons.

Three systems of valuing milk are discussed. By the first system the returns from cheese sold are divided among patrons by the "pooling plan" according to the weight of milk delivered. This system is based on the false assumption that all milk is of equal value per 100 lbs. for the purpose of making cheese.

The second system is known as the "fat system". The basis or principle of this test is that all normal milk for cheese making is valuable in proportion to the fat which it contains. It is argued by the advocates of this system that the fat is the most valuable part of the milk; that the yield of cheese is in fair accord with the fat content of the milk; that the testing of milk for fat can be applied to factory conditions. Against this system a number of objections are urged, the chief being that the cost of testing the milk is too great and that the fat is not an exact measure of the relative cheese value of milk. Tests showed that as the percentage of fat in the milk decreased from 5 to 3 there was an increase in the yield of cheese per pound of fat in the milk, but a decrease in the pounds of cheese made per 100 lbs. of milk.

The third system is known as the fat-casein plan. The arguments stated in favour of this plan were as follows:

1. The fat and casein of milk are the two chief and most valuable constituents which enter into the making of cheese.

2. The yield of cheese is fairly in accord with the fat-casein content of the milk. During the season of 1910, at the O. A. C., the extreme variation of the yield of cheese per pound of fat and casein was 1.607 lbs. of cheese in the month of June to 1.452 in October, a difference of but 0.155 lbs.

3. This is the fairest and most just plan yet devised because it comes nearest to a measure of the cheese yielding capacity of normal milk.

Against this plan it is argued that the double testing is expensive and not practical under factory conditions.

As an alternative the author suggests the determination of the percentage of fat in milk by means of the Babcock test and then adding 2 for casein.

That the " fat plus 2 " is near enough for all practical purposes is indicated by the results of tests for casein at 10 cheese factories in Ontario during the season 1911, May 15th to September 15th, where the average percentage of casein in milk of between 400 and 500 patrons, was 2.22. The average percentage of fat in the milk as delivered by these patrons was 3.44.

The excess of casein above two per cent. is counterbalanced by the fat and casein lost in the whey, so that when the factor 2 is added to the percentage of fat, we have for all practical purposes, the available percentage of fat and casein in milk for cheese making.

Summarizing and concluding, the author observes:

1. Milk and cheese at factories ought to be tested, because of the natural and artificial variations which milk is subject to.

3. Both fat and casein ought to be determined and both are of equal value pound for pound for the manufacture of cheese, at least, casein is worth as much or more per pound than is milk fat, because it is the nitrogen and moisture carrying compound, which makes it of special importance in milk for cheese making.

3. Legislation compelling the testing of milk at cheese factories and paying for he same on a fat-casein basis, and the appointment of public inspectors for the purpose of accurate testing may be necessary in the near future to prevent fraud on the public and to obtain " cold justice " for patrons of cheeseries throughout Ontario.

INDUSTRIES DEPENDING ON PLANT PRODUCTS.

PORCHET, F. (Director of the Vine-growing station of Lausanne, Switzerland). **The Wines of 1911 in the Canton of Vaud, Switzerland** (Les vins de 1911 dans le Canton de Vaud, Suisse). — *Procès Verbaux de la Société Vaudoise des Sciences naturelles*, No. 4, 1912. Séance du 7 Fév. 1912, Lausanne. — *La Terre Vaudoise*, 4e Année, No. 5, pp. 49-51 ; No. 6, pp. 60-62. Lausanne, 3 et 10 Février 1912. 718

Switzerland

The persistent drought of the summer of 1911 hindered the usual exchange of matter between the vine-leaves and the grapes, so that as vintage time approached the grapes were poor in sugar, while their total acidity was still high.

On September 5, 1911, on analysing the grapes from the Champ de l'Air, (Vine-growing Station) the writer found 10.25 % of sugar and 15.4 ‰ of total acidity. On September 12 the figures had scarcely changed : sugar 10.85 %, acidity 15.4 ‰. Some light rains (10 to 15 mm. [0.4 to 0.6 in.]) between the 15th and 16th September were sufficient to alter sensibly these figures. On September 19 analysis showed that the sugar had risen to 16.27 %, whilst the acidity had fallen to 8.9 ‰. A sudden transformation had thus taken place in the grapes : the absorption of moisture though slight had increased the sugar and diminished the acidity.

The persistent drought of 1911 caused a further anomaly: the general diminution of the acids. Already in the must a low degree of acidity was found, and this is the general character of the 1911 wines.

Composition of the 1911 Vaudois musts and wines. — In order to have precise data on this object, the Vine-growing station of Lausanne analysed, during the vintage, 142 typical samples of musts. The readings with Oechsle's densimeter ranged from 60 to 92 degrees, but 81 % of the musts gave between 70 and 90 °. The determinations of sugar by chemical analysis have confirmed very exactly the densimeter readings.

The wines resulting from the fermentation of these musts have theoretically an alcoholic content comprised between 8 and 12.4 %. 67 % of these wines contain 10 % of alcohol and upwards.

The total acidity of the 142 musts that were analysed varies between 4.3 and 8.8 ‰. 64 % are below 7 ‰, whilst in normal years the acidity ranges from 6 to 12 ‰, that is, an average of 8 ‰. Since fermentation generally causes the acidity to diminish by 1 to 1.5 ‰ it was easy to foresee at vintage time that the new wines would have an extraordinarily low degree of acidity.

To ascertain this experimentally, the station analysed, in January 1912, 36 samples of clear wines produced in districts where the acidity of the musts was lowest (shores of Leman), and found that only one of the 36 samples contained less than 10 % of alcohol, and only one more than 6 ‰ of total acidity. The lowest amount of acidity found was 3.5 ‰. It is true that in 1900 and 1906 in the Vaudois vineyards some wines were found here and there containing less than 4 ‰ of acidity, but this was quite exceptional, as the average acidity varied between 6 and 7 ‰. In 1911 on the contrary it ranged from 4 to 5 ‰ in the great majority of the samples that were analysed.

To form an exact idea of the composition of the Vaudois wines, it is necessary to await the results of the analytical statistics which are drawn up at the time of the first racking (1). It can however already be stated that the Vaudois 1911 wines are precocious.

From the first they formed a very agreeable beverage, as they were not at all acid. They must be racked soon and bottled when still young. According to all probability they will also ripen quickly in casks or bottles.

Treatment of the Vaudois 1911 wines. — The exceptional composition of the wines, together with the abnormal mean temperature of December and January, render necessary a special watchfulness, and in some cases perhaps a special treatment. Everything that tends still further to diminish the low acidity of the wines must be carefully avoided, as for instance, their prolonged contact with the lees; and therefore it is recommended to rack them much earlier than usual.

On the other hand the mild temperature of the past winter exposes wines to two other dangers: 1. The disengagement of carbonic dioxide gas, which would cause the finer particles of the lees — ordinarily containing the germs of wine-diseases — to reappear in suspension in the wine. 2. A second very slow fermentation of the undecomposed sugar, which would cause a certain motion in the wine; should this second fermentation appear the wine must be immediately racked.

As the 1911 Vaudois wines generally fermented rapidly and completely, they are in consequence not liable to dangerous second fermentations. On the other hand, unless the temperature were to fall considerably there is reason to fear, especially in not very deep cellars, the *rising of the lees*, such as takes place in spring in wines that have not been racked. To prevent this, it is sufficient to rack, at the proper time, the new wines. If the rising of the lees should already have commenced, the wine must be immediately racked, after fumigating thoroughly, with sulphur dioxide, the vessel into which it is poured. One week after racking, potassium bisulphite in crystals, at the rate of 5 in 100 000, should be added by placing it in a small linen bag and suspending and agitating it in the wine. As soon as the wine is again perfectly clear it is to be racked a second time. The same treatment will be found successful with those wines which, either racked or unracked, show a tendency to turn brown on contact with the air: the so called « *casse* ».

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(1) The analytical statistics of Swiss wines appears every year in the *Travaux de Chimie alimentaire et d'Hygiène* published by the Swiss Federal Sanitary Service.

Summarizing, the author advises to begin the spring racking in February, separating the wine from the lees, and to watch carefully those wines that have not yet been racked.

714 MUTTELET, F. and TOUPLAIN, F. **Arsenate of Lead in Viticulture.** (1) (L'Arseniate de Plomb en Viticulture). — *Annales des Falsifications*, V. Année, No. 30, pp. 9-16. Paris, Janvier 1912.

France

The use of arsenical insecticides, and especially of preparations of arsenate of lead, has considerably increased of late. This has led to the question being raised as to whether such products are a danger to health. The Academy of Medicine has declared that they are, and has expressed the hope that the use of these insecticides may be either entirely forbidden, or at least placed under strict regulations.

The Service for the Repression of Fraud has therefore decided to attack this complex problem, by searching for arsenic and lead in products derived from vines that have undergone the arsenic treatment, namely, grapes, wines, grape pomace and lees.

The results are given in the following table:

Samples.	Arsenic, mgm.	Lead, mgm.
Vines treated:		
Whole dried grapes (17 samples); per 100 gm. of dry product	0.050 to 0.300	0.00 to 200.0
Dried pomace (31 samples) per 100 gm. of dry product	0.012 to 1.250	0.00 to 20.00
Wines (10 samples); per 1 000 cc. of must	0.012 to 0.620	nil
Lees (10 samples); per 1 000 cc. of must	0.040 to 0.400	nil
Vines not treated:		
Dried pomace (2 samples); per 100 gm. of dry product	0.038 to 0.060	nil
Wines (2 samples); per 1 000 cc. of must	0.500	nil
Lees (2 samples); per 1 000 cc. of must	0.500	nil

Conclusions:

1. As regards arsenic.

Grapes, grape pomace, wines, second wines and lees obtained from vines treated with arsenate of lead contain no more arsenic than what is found in the products of non-treated vines.

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(1) See *B*. April 1911, No. 1260. (*Ed.*).

2. As regards lead.

Wines and second wines contain no lead

In certain cases the lees contain a considerable proportion of lead. There is therefore some danger in drinking wines or second wines before the lees are precipitated.

Grapes sometimes retain on their surface a certain quantity of lead, which makes their consumption dangerous.

715

PAVARI, ALDO. **The Action of Organic Acids on the Development of the Bacillus which Causes "turned" Wines**. (Ital. "*Girato*"; Fr "*Tourne*"). (Azione degli acidi organici sullo sviluppo del bacillo producente il "*Girato*" dei vini). — *Giornale Vinicolo Italiano*; Anno 88, No. 6, pp. 104-108. Casale Monferrato, 11 Febbraio 1912.

Italy

By previous experiments, the writer has shown that this affection of wines is due to a bacillus, and that the two most effective agents for combating the disease are heat and sulphur dioxide, alcohol being of little use, when albuminoids and sugars are present in perceptible quantities The writer having already shown that 8 ‰ acid potassium tratrate arrests the development of the bacillus, and that tannin has very little effect, undertook the present experiments for the purpose of studying the antiseptic action of the other acids in wine.

Series A. — Development of the bacillus in cultures containing one of the acids which are found in wine or added during its manufacture.

Matic Acid.

Acid ‰	0,5	1	1,5	2	2,5	3	3,5	4	5	6	8	10
After 24 hours . . .	—	—	—	—	—	—	—	—	—	—	—	—
» 48 » . . .	—	—	—	—	—	—	—	—	—	—	—	—
» 3 days . . .	+	+	+	+	—	—	+	+	—	—	—	—
» 4 » . . .	+	+	+	+	—	+	+	+	—	—	—	—
» 5 » . . .	+	+	+	+	+	+	+	+	—	—	—	—
» 6 » . . .	+	+	+	+	+	+	+	+	+	—	—	—
Following days . . .	+	+	+	+	+	+	+	+	+	—	—	—

The development increased gradually with concentrations of 0.5 to 3.5 ‰, and decreased till 5 ‰, when it ceased.

Succinic Acid

Acid ‰	0,5	1	1,5	2	2,5	3	3,5	4	5	6
After 24 hours . . .	—	—	—	+	—	—	—	—	—	—
» 48 » . .	+	—	—	+	+	—	—	+	—	—
» 3 days . . .	+	+	+	+	+	+	—	+	—	—
» 10 » . . .	+	+	+	+	+	+	+	+	—	—
Following days . .	+	+	+	+	+	+	—	—	—	—

Development usually weak; bacilli more numerous in the solutions of 0.5 to 1.5 ‰. In more concentrated solutions (3.5-4 ‰) the bacilli which developed died in the course of a short time, peshaps on account of the acidity which they produced and which increased the acidity of the solution, which already nearly reached the limit of concentration which they conld resist.

Citric Acid.

Acid ‰	0,5	1	1,5	2	2,5	3	3,0	4	5	6
After 24 hours	—	+	+	+	+	+	—	—	—	—
» 48 »	+	+	+	+	+	+	—	—	—	—
» 3 »	+	+	+	+	+	+	+	—	—	—
Following days	+	+	+	+	+	+	+	—	—	—

The development was almost as great as in the case of the malic acid solutions; little with concentrations of 3 and 3.5 ‰.

Series B. — Development of the bacillus in cultures containing 4 ‰ of acid potassium tartrate to which was added gradually increasing amounts of the preceding acids.

Malic Acid.

Acid ‰	0,5	1	2	3	4	5	6	7	8
After 24 hours .	+	+	+	+	+	—	—	—	—
» 48 »	+	+	+	+	+	—	—	—	—
» 3 days	+	+	+	+	+	+	+	—	—
» 4 »	+	+	+	+	+	+	+	+	—
Following days .	+	+	+	+	+	+	+	+	—

Very abundant development in the solutions from 2-4 ‰; less in the others.

Succinic Acid.

Acid ‰	0 5	1	2	3	4	5	6
After 24 hours	—	—	—	—	—	—	—
» 48 »	+	—	—	—	—	—	—
» 3 days	+	—	—	—	—	—	—
» 5 » . . .	+	+	—	—	—	—	—
» 10 »	+	+	+	+	—	—	—
Following days	+	+	+	+	+	+	—

Moderate development only in the solutions of 0.5 and of 1 ‰ and after five days, very feeble in the others and scarcely any to distinguished in that of 5 ‰.

Citric Acid.

Acid ‰	0,5	1	2	3	4	5	6	7	8
After 24 hours	+	+	—	—	—	—	—	—	—
» 48 »	+	+	—	—	—	—	—	—	—
» 3 days	+	+	—	+	+	—	—	—	—
» 7 »	+	+	+	+	+	+	+	—	—
Following days	+	+	+	+	+	+	+	+	—

Development moderate in general; more in the solutions of 3-4 ‰.

The following conclusions may be drawn:

1. It is malic acid that allows the strongest development, namely at 5 ‰, while succinic acid checks it, when it occurs in the proportion of 3.5 ‰, and citric acid in the proportion of 4 ‰. With malic acid the development of the bacillus traces an ascending curve, up to the concentration 3.5 ‰, when the bacillus behaves as with tartaric acid. This seems to show that also malic acid may be a source of vital energy for thc bacillus.

2. When acid potassium tartrate is present to the amount of 4 ‰, the concentration limits rise to 7 ‰ for malic and citric acid and 4-5 ‰ for succinic. This means that the bacillus can resist a *total acidity*, which, expressed in tartaric acid, may exceed 10-11 ‰. Thus it is clear that *even a high total acidity does not mean an effective prevention of "turning"*.

3. Succinic acid checks the development of the bacillus more than the other two, but its full effect can only be obtained with a concentration of 4 ‰, which is *pratically impossible.*

4. The addition of malic and citric acid, within the limits allowed by the law, neither prevents nor arrests the disease.

5. The best course is to freely use sulphur dioxide, and to keep the wine constantly clear by the most careful *hygienic* rules.

716 FOTH. **The Alcohols of Maize and Potato.** (Alcool de Maïs et de Pomme de terre). — *Bulletin de l'Association des Chimistes de sucrerie et de distillerie*: 29e Année, T. XXIX, No. 7, pp. 471-472. Paris, Janvier, 1912.

France

A comparison has been made between the working of 90 kg. (198 lb.) of maize and 10 kg. (22 lb.) of barley in producing 36 litres (7.92 gals.) of alcohol with that of 100 kg. (220 lb.) of potatoes at 18 % and 1,80 kg. (3.96 lb.) of barley in giving 12 litres (2.64 gals.) of alcohol.

In a factory where 600 litres (132.00 gals.) of pure alcohol are made, the steam required for a hectolitre of pure alcohol is as follows:

Potatoes, 1 150 kg. (21.85 cwt.) for heating, 2 850 kg. (54.15 cwt.) for the machines.

Maize 1950 kg. (37.05 cwt.) for heating, 2850 kg. (54.15 cwt.) for the machines.

Thus for potatoes 4 000 kg. (76.00 cwt.) of steam = 120 kg. (2.28 cwt.) of coal = 3,75 fr. (2*s* 11.7*d*).

For maize 4800 kg. (91.20 cwt.) of steam = 144 kg. (2.74 cwt.) of coal = 4,50 fr. (3*s* 6.8*d*).

The cost is as follows:

	fr.	£	s	d
Maize 90 kg. (198.00 lb.) at 22,50 fr. (17*s* 10.3*d*) per ql.	20.25		16	0.9
Barley 10 » (22.00 lb.) » 0.20 » (1.9*d*) » »	2.00		1	7
	22.25		17	7.9
Deduct, draff	6.25		4	11.5
	16.00		12	8.4
Thus for 100 litres: (22 gals.) $\frac{1600}{36}$ = ...	44.44	£1.	15	3.2
Add, coal	4.50		3	6.8
Total	48.94	£1.	18	10.

without wages and amortisement.

For potatoes we have:

100 kg. (22 lb.) at 18 %	5.75		4	6.8
Barley 1,8 kg. (3.96 lb.)	0.36			3.4
	6.11		4	10.2
Deduct, draff	0.75			7.1
	5.36		4	3.1
Thus for 100 litres (22.00 gals.) of alcohol $\frac{536}{12}$ =	44.67	£1.	15	5.4
Add coal	3.75		2	11 7
Total	48.42	£1.	18	5.1

without wages and amortisement.

It is clear that if the potatoes cost 5,90 fr., (4*s* 8.2*d*) this increases the cost of alcohol by $\frac{15}{12}$ = 1,25 fr. (11.9*d*) and consequently the price per hectolitre is raised to 49,67 fr. (£1. 19*s* 5*d*).

Thus 100 kg. (220 lb.) of potatoes at 5,81 fr. (4*s* 7.3*d*) + 1.8 kg (3.96 lb.) of barley at 20 fr. (15*s* 10.5*d*) may be replaced by 90 kg. (198 lb.) of maize at 22.50 fr. (17*s* 9.3*d*) + 10 kg. (22 lb.) of barley at 20 fr. (15*s* 10.5*d*).

717 AMMANN, LOUIS. **Studies on Pulps from Distilleries and Sugar-Factories.** (Comparaison des resultats obtenus par la macération et par la diffusion dans les distilleries agricoles des betteraves. — *Comptes Rendus de l'Académie des Sciences*, T. 154, No. 5, pp. 294-295. Paris, 29 Janvier 1912. — Influence comparée de l'eau et de la vinasse sur la composition des pulpes de sucrerie et de distillerie. — *Comptes Rendus de l'Académie des Sciences*, T. 154, N. 6, pp. 366-369. Paris, 5 Février 1912.

France

The Author has followed the processes of distillation of beets in a number of distilleries during two consecutive seasons, with a view to ascertaining whether the small concerns in which home-grown crops are treated by maceration, give as good results as distilleries of a more industrial type.

By determining the sugar contents of the slices before going into the diffuser or macerator and of the pulp remaining afterwards, he found that the two processes gave equally perfect results.

Thus owners of small concerns may use the maceration process without fear of leaving any sugar in the pulps fed to their live stock. The maceration battery, then, is the one for small concerns without specially trained staff, while the diffusion battery, being quicker and more compact, is preferable for factories dealing with over 50 to 60 tons of beets per day.

Beet-pulps are produced by both distilleries and sugar-factories, and it is further of importance to determine the influence on them of the liquid used to extract the sugar.

In the case of sugar factories, the beets are completely exhausted, and the pulp is only a by product; while in many distilleries the pulp is considered as the principal product. In the first case fresh water is used for the extraction, while in the second the liquid used is the hot residue from distillation. The differences in the resulting pulps are shown by the analyses made by the Author. Distillery pulps are richer in alcoholic extract, phosphoric acid, and soluble matter, and are more readily assimilated by animals; they are consequently of higher feeding-value.

718 **The Starch Industry in Holland**. (Les industries des produits chimiques et de la fécule). — *Moniteur Scientifique*, 56^{e} Année, 842^{e} Livraison. — *Le Mercure Scientifique*, pp. 11-12. Paris, Février 1912.

Netherlands

The starch of various crops, indigenous and otherwise, such as potato, wheat, rice, maize, is a raw material of great importance for several industries in Holland.

This industry began more than two hundred years ago as factories of starch products. In 1818 there were 31 of these factories in Holland, 15 of them being in North Holland (Zaan neighbourhood).

Rice and wheat, formerly the staples of this industry, have largely given place to maize, which is cheaper. The consumption of rice starch in Holland is insignificant, and what is manufactured is chiefly for export.

The preparation of maize-starch has increased considerably in the last ten years; there are three factories, whose output is largely consumed in the country, but some of it is exported, chiefly to Great Britain. The starch is prepared as powder and in lumps; the powder is used chiefly in the textile industry.

Wheat-starch, of which the manufacture is declining, is sent partly to Great Britain.

After the starch has been extracted from wheat-flour, gluten is obtained from the residue: this is used specially for making bread for persons suffering from diabetes. Maize-gluten is pressed and sold as cattle-food.

At present there are 13 of these starch-factories in Holland, employing 400 workmen; 8 of them are in the Zaan neighbourhood.

The following figures, from the Dutch Statistics of Importation, Exportation and Transit, show the imports and exports of cereal starch since 1847:

Period	Imports (metric tons)	Exports (metric tons)	Balance	
			Imports	Exports
1847-56 . . .	4	15	—	11
1857-66 . . .	28	6	22	—
1867-76 . . .	293	442	—	148
1877-86 . . .	2 257	2 350	—	93
1887-96 . . .	7 990	6 027	1963	—
1897-1906 . .	15 794	11 510	4284	—
1909	13 658	12 196	1462	—

The starch industry extended notably when the preparation of potato-starch began. The first factory was set up in 1840, at Muntendam, and it was soon followed by others; the increasing demand for this article caused a rapid increase in the number of factories and in their output. In a short time the peat soils in the provinces of Groningen and Drenthe, and later those in Over-ijsel, which are very useful for potato-growing after the removal of the peat, became real industrial centres.

The actual production of the starch is only a part, but the most important part, of the potato-starch industry: the other products are dextrin and glucose.

In Holland there are 30 factories, of various sizes, which prepare nothing but dry potato-starch; two others prepare wet starch, an intermediate product used for making dry starch and glucose. Six other Dutch factories use part of the starch, before drying, for the preparation of dextrin, which is obtained by heating with potassium nitrate. Six others treat the wet starch with acids to prepare glucose (also called potato-sirup).

Of these factories, 32 are in the province of Groningen; six of these are cooperative, while the rest purchase the potatoes required.

There are also some factories in which dextrin and glucose are prepared from dried potato-starch, or other starches (maize, sago, tapioca, etc.). The whole starch industry employs about 2000 workmen. In good years the total consumption of potatoes by the factories which shred on the premises is 12 million hectolitres (33 million bushels), weighing about 61 kg. per hl. (49 lbs. per bu.); at the normal price, this represents a value of about 20 million francs (about £800 000). The area occupied by potatoes for starch was 28 322 hectares (nearly 70 000 acres) in 1909. By intensifying the culture, the crop is made to keep pace with the growing demands of the industry.

The greater part of the dried potato-starch and dextrin is exported to countries having a large textile industry, especially to those with low import duties. The glucose is almost all consumed in Holland.

The imports and exports of potato-starch were about equal from 1847 to 1856, while in 1906 the exports exceeded the imports by over 63 000 tons, and in 1909 by 64 000 tons. The total production has nearly doubled in the last ten years. About 15 % of the amount produced is consumed at home; the exports go to Great Britain, Belgium, Italy, Spain, France, Hamburg (within the free port area) and Denmark.

With dextrin, also, the production is greater than the home demand, so that a good deal goes abroad; the chief purchasers are Great Britain (Lancashire), Belgium, Canada, Spain, Norway and Japan.

The Dutch statistics give only "potato-starch" and "articles prepared from potato-starch"; this last is used to include a number of products such as sago flour and maize flour, besides dextrin; consequently, no precise figures are available for dextrin exportation, but it is valued at 5000 tons a year.

Owing to technical and chemical progress, the glucose industry, which began in a small way some thirty years ago, has grown rapidly and is now an important industry providing for a large number of people. There are now 11 factories, including the 6 above mentioned, which turn out glucose; it is prepared either as a solid (known as grape-sugar) or as a liquid (sirup), the latter being the more important.

The sirup and grape-sugar are use in confectionery and for sweets; grape-sugar is also used in breweries, partially replacing malt. Glucose is used besides in the textile industry and in rice-husking.

Dutch glucose is generally superior to all others, but it is almost all used at home as the import duties in the surrounding countries are too high to allow of exportation; a small quantity goes to Great Britain.

GRÉLOT, '. **Split Green Peas, Coloured Artificially.** (Pois verts cassés colorés artificiellement). — *Annales des Falsifications;* V^e Année, No. 39, pp. 18-19. Paris, Janvier 1912. **719**

France

The author first remarks that Mr. Pagniello has detected the use of chlorophyll and dextrine as a colouring for dried peas, little as one might expect it, and then turns to consider a similar fraud carried out by means of a colouring derived from coal.

Split peas, when not tampered with, show all tints, from the pure green of chlorophyll to yellow, while peas artificially coloured are uniformly dark green. If carefully looked at, most of them show layers of colouring matter on their surfaces. This matter can be easily detached, and it is found between the tegument and cotyledon in cases where the former still remains. The fraud is too simple to escape attentive observation.

From Mr. Grelot's investigations it results that the colouring is probably a sulphur conjugate, belonging to the group of quinones-oximes, analogous to naphtol green.

In addition to the colouring matter the peas also contain some gelatine, probably to retain the former on the surface, and also to cause a shiny appearance.

The decree of 4 July 1910 allows, by way of exception, the use of certain substances derived from coal for colouring bonbons, pastilles etc. But this is because only a very small amount is necessary, and also because such products are not normal foods of daily consumption.

The colouring of dried vegetables continues to be strictly prohibited, and each case detected ought to be adequately punished.

720 BONN, A. **Repression of Food Adulteration in France:** Synopsis of the Principal Foods and of the Laws and Regulations concerning them. — *Annales des falsifications*, V^e Annéè, N^o. 39, pp. 20-25. Paris, Janvier 1912.

France

Nature of Foods —	Adulterations or transgressions to be sought for —	Ministerial Circulars or special laws, besides the law of August 1. 1905.
Butters Law of April 16, 1897; Law of July 23, 1907, Decree of Aug. 29, 1907.	Margarine	Law of April 16, 1897 (art. 1)
	Coconut oil	do
	Other fats	do
	Antiseptics	Ministerial Circular Dec. 15, 1908.
	Colouring (aniline colours are forbidden)	M C May 24, 1910
	Water	M. C July 20, 1911.
Beers Decree of July 28, 1908.	Substitutes for barley malt (exceeding 20 %)	Decree of July 28, 1908 (art. 1)
	Substitutes for hops	do
	Sulphur dioxide (exceeding 1 in 10 000, with toleration of 10 %	M. C. April 14, 1911
	Antiseptics	Decree of July 28, 1908 (art. 40).
	Saccharine	Law of March 30, 1902. (art. 49 to 56). Law of Dec. 26, 1908 (art. 19)
	Colouring (none permitted, with the exception of caramel, and the extracts obtained from roasted cereals, starchy substances, inverted sugar or glucose).	Decree of July 28, 1908 (art. 4).
	Original density (small beer)	Decree of July 28, 1908 (art. 2).
	Toxic metals	

Nature of Foods	Adulterations or transgressions to be sought for	Ministerial Circulars or special laws, besides the law of August 1. 1905.
Ciders and Perries Decree of July, 28, 1908.	Alcohol, dry extract, mineral matter (small cider and small perry)	Decree of July 28, 1908 (art. 2).
	Sulphur dioxide, exceeding 2 per 10 000, with toleration of 10 %	M. C. of April 14, 1911.
	Saccharine	Law of March 30, 1902 (art. 49-54). Law of Dec. 26, 1908 (art. 19).
	Tartaric or citric acid, exceeding 5 per 10000	Decree of July 28, 1908.
	Colouring (by substances other than cochineal, caramel, and chicory infusion)	
	Antiseptics	M. C of Dec. 15, 1908.
Flours	Excessive moisture	
	Mineral matters	M. C. of May 7, 1907.
	Flour, other than that specified	M. C. of May 1, 1907.
	State of preservation, commercial and baking quality.	
	Bleaching, by nitrous compounds not declared . . .	
Cheeses	Nature and quantity of fat. .	
	Mineral matters in the rind. Ba SO4 etc.	
	Antiseptics	M. C. of July 19, 1910.
Preserved and dried fruits, Fruit cheeses Decree of Dec. 19, 1910.	Antiseptics	Decree of Dec. 19, 1910 (art. 15).
	Colouring matters	Order of Dec. 19, 1910 (art. 1-3).
	Preserved fruits, fruit cheeses, fruit sirups, declared " pure sugar "	
	Sweet substances other than saccharose	Decree of Dec. 19, 1910 (art. 9).
	Preserved green fruits : Copper (exceeding 1 per 10 000)	Order of Dec. 19, 1910 (art. 4).
	Dried fruit : Sulphur dioxide (exceeding 1 per 10 000)	Decree of Dec. 19, 1910 (art. 15).
	Nuts, moistened and sold by weight	

Nature of Foods —	Adulterations or transgressions to be sought for —	Ministerial Circulars or special laws, besides the law of August 1. 1905.
	Substances other than those named.	
Fats and oils Decree of March 11, 1908; Decree of July 20, 1910.	Fats:	
	Water (the presence of emulsified water renders the goods subject to the regulations for margarine)	M. C. of October 14, 1910.
	Oils:	
	Colouring (use of aniline colouring matter is forbidden)	M. C. of May 24, 1910.
	Labels, brands, marks (such as an olive tree or olive branch on bottles containing oil other than olive oil)	
Milk	Watering.	
	Skimming.	
	Watering and skimming	
	Antiseptics	M. C of Dec. 15, 1908.
	Bicarbonate of soda or other alkalis	M. C. of Jan. 24, 1910.
Margarines Law of April 16, 1897; Law of July 23, 1907; Decree of Sept. 5, 1907.	Butter (at most 10 %)	Law of April 16, 1897 (art. 2).
	Antiseptics	M. C. of Dec. 15, 1908.
	Colouring (forbidden)	Law of April 16, 1897 (art. 2).
Bread	Nature of flour used	
	Sulphate of copper or other foreign mineral matter	
Sugars Decree of Dec. 19, 1910.	Colouring	Decree of Dec. 19, 1910 (art. 3).
	Vanillin sugar called "vanilla" sugar	Order of Dec. 19, 1910 (art. 2).
	Refined sugars:	
	At least 99 % of saccharose	Decree of Dec. 19, (art. 1).
	White crystallized sugars:	
	From 98 to 99.5 % of saccharose	do.
	Inferior sugars, brown sugars from 85 to 98 % of saccharose	do.
	Inverted sugars:	
	Non-inverted sugar maximum 20 %	do.

Nature of Foods	Adulterations or transgressions to be sought for	Ministerial Circulars or special laws, besides the law of August 1. 1905.
Sugars Decree of Dec. 19, 1910.	Water, maximum . . . 25 %	
	Mineral matter . . . 0.5 %	
	Acidity as H_2SO_4 . . 0,35 %	
	Poisonous substances.	
	Molasses :	
	Mineral matter, maximum 12 %	Decree of Dec. 19, 1910 (art. 2).
	Poisonous substances . . .	
	Glucose in lumps :	
	Water . . . . maxim. 25 %	Decree of Dec. 19, 1910 (art. 4).
	Dextrin . . . . .15 %	
	Mineral matter . . . . 1.50 %	
	Acidity as H_2SO_4 . . 0,5 %	
	Arsenic	
	Crystal glucose, crystal sirup :	
	Water . . . . maxim. 25 %	
	Dextrin . . . . 45 %	
	Mineral matter . . 1 %	
	Acidity as H_2SO_4 . 0,20 %	
	Arsenic	
	Maltose :	
	Other sugars	Decree of Dec. 19, 1910. (art. 4).
Teas	Foreign substances	Congress for the Repression of Fraud (Geneva 1908 and Paris 1909)
Wines Law of Aug. 14, 1889 ; Law of July 11, 1891 ; Law of July 24, 1894 ; Law of April 6, 1897; Law of Jan. 28, 1903 ; Law of Aug. 6, 1905 ; Law of June 29, 1907 ; Law of July 15, 1907 ; Decree of Sept. 3, 1907.	Watering	M. C. of April 2, 1910
	Addition of alcohol	
	Colouring	Law of July 11, 1891 (art. 2).
	Mineral acids	do.
	Sodium chloride (beyond 1 per 1000)	do.
	Plaster of Paris (beyond 2 per 1000 of potassium sulphate).	Law of July 11, 1891 (art. 3) and M. C. of Jan. 10, 1908.
	Addition of sugar	M. C. of Feb. 18, 1910.
	Saccharine	Law of March 30, 1902 (art. 49 to 56).
	Sulphurous acid (beyond 0.45 per 1000)	Law of Dec. 26, 1908 (art. 19).

Nature of Foods —	Adulterations or transgressions to be sought for —	Ministerial Circulars or special laws, besides the law of August 1. 1905.
Wines Law of Aug. 14, 1889; Law of July 11, 1891; Law of July 24, 1894; Law of April 6, 1897; Law of Jan. 28, 1903; Law of Aug. 6, June 29, 1907; Law of July 15, 1907; Decree of Sept. 3, 1907.	with toleration of 10 %:	
	0.1 gr. free and 0.35 gr. combined per 1000	M. C. of April 14, 1911.
	Glycerine (forbidden)	Sup. Council of hygiene March 8, 1911.
	Antiseptics	M. C. of Dec. 15, 1908 and April 29, 1909.
	Sweetening	M. C. of May 13, 1908.
	Citric acid (beyond 0,5 per 1000)	M. C. of May 13, 1908.
	Tartaric acid	M. C. of Jan. 28, 1910.
	Turning sour or otherwise spoiling	M. C. of June 17, 1910.
	Deacidifying	M. C. of Jan. 26, 1910.
	Decolouration	M. C. of Nov. 23, 1909 and March 15, 1910.
	Removing sulphurous acid by chemical agents	M. C. of Dec. 28, 1909.
Vinegars Decree of July 28, 1908.	Conformity to designation . .	
	Content of acetic acid. . . .	
	Pyroligneous acid, mineral acids. Distillation residues. .	Decree of July 28, 1908 (art. 4).
	Artificial colouring	do. (art. 5).
	Alcohol vinegars :	
	At least 55 per 1000 of acetic acid	M. C. of March 24, 1909.
	Wine Vinegars :	
	At most 1° of non transformed alcohol.	M. C. of Sept. 18, 1911.
	Beer Vinegars :	
	At most 0.5° of non-transformed alcohol	do.
	Cider Vinegars :	
	At most 0.5° of non-transformed alcohol	do.

PLANT DISEASES.

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

Experiment and Demonstration Fields for the Control of the Diseases of the Olive Tree in France. — See above N. 599. 721 **France**

ublications of the Russian Government relating to the Control of Plant Diseases. (Obiavlenia ob Departamenta semledieliia G. U. S. i. S. Communicated by the Department of Agriculture of the Russian Government). — *Xurnal Boliesni Rastenii.* (Journal of Plant Diseases), God. V, N. 5-6, *ad fin.* S. Peterburg, 1911. 722

Russia The Russian Government (Department of Agriculture) is publishing pamphlets for circulation with a view to promote and encourage the control of plant diseases; these pamphlets are distributed gratis on request. Last year the following were published.

1. American gooseberry mildew (*Sphaeroteca mors uvae*).
2. Insects injurious to raspberry and currants.
3. Lepidoptera most harmful to horticultural plants.

The Agricultural and Horticultural Colleges, Agricultural Societies, and those of Rural Economy, can obtain copies of the above pamphlets gratis, on application either to the Inspector of Agriculture, or direct to the Government office (Agric. Section).

STATIONS FOR PLANT PATHOLOGY AND AGRICULTURAL ENTOMOLOGY.

728 MARCHAL, PAUL. **Summary of the Results of Researches on *Conchylis* and *Eudemis* during 1911.** (The Work of the Temporary Stations established in 1911, for the study of the most Efficacious Methods for the Destruction of *Conchylis* and *Eudemis*) (1). — (L'activité des Stations temporaires établies en 1911 pour l'étude des procédés les plus efficaces de destruction de la *Conchylis* et de l'*Eudemis*. Rapport sommaire sur les travaux accomplis par la mission d'étude de la *Conchylis* et de l'*Eudemis* pendant l'année 1911). — *Journal officiel de la République française*, 44e année, No. 44, pp. 1461-1464. Paris, 14 Fevrier 1912.

France

This is a preliminary report drawn up by M. Marchal, Director of the Paris Entomological Station, at the request of the French Minister of Agriculture, of the work accomplished by the temporary stations set up to study the best means of destroying *Conchylis* and *Eudemis*, two of the most serious vine pests in France.

M. Chatanay, Director of the Station at Châlons-sur-Marne, has turned to good account the large installations of lamp-traps which have been established in Champagne for the purpose of making experiments in the methods of control. He has proved the following points

1. With a well-established system of lamps as in the case of the electric installation at Verzenay, it is estimated that the greater number of the moths hatched out since the preceding night in the area covered by the lamps are caught, and the number of eggs laid is thus reduced about 50 %.

2. The males and females are caught in about the proportions in which they naturally occur, and the females are in different stages of egg-laying. If the traps are set in fine weather from the commencement of the flight of the moths, most of the females caught have not yet laid their eggs.

3. At the commencement of flight, the males are taken in far larger numbers than the females, which shows that the former hatch

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(1) See *B* July 1911, No, 2269. (*Ed.*).

out earlier. The greater number are caught before fertilizing, and thus the capture of the males has about the same importance as that of the females.

4. The use of lamp-traps, as carried out in Champagne, has a definite, though limited, value, and is at least as efficacious as most insecticide spraying.

5. In the case of valuable vineyards, like those in Champagne, the lamp-trap method is practical and not excessively costly.

6. The chief disadvantage of this system is that it causes the destruction of parasitic Hymenoptera and other natural auxiliaries in the destruction of *Conchylis* and *Eudemis*. In any case, this aspect of the question requires further investigation.

7. The efficacy of lamp-traps depends upon the observance of certain rules of which, for Champagne, the following are the most important.

The traps should make a continuous net-work, over as extensive an area as possible; they should be placed nearly level with the ground in the immediate neighbourhood of the receptacles containing the liquid, as the reflection of the light in the liquid plays a great part in attracting the moths; the surface of the liquid should, therefore, be kept as bright and clean as possible and the cone of shadow thrown must be as small as possible. Since the action of the traps depends chiefly upon the rays of direct or reflected light, the sources of light must be fairly numerous, but not too bright; 8 lamps of 5 candle-power per acre would be very efficacious.

8. A succession of calm warm nights gives the maximum success in the use of lamp-traps.

M. Chatenay has also undertaken biological researches; and he states that meteorological conditions have great effect on the vitality, and consequently on the multiplication of the moths. The almost complete disappearance of the second generation of *Conchylis* observed in 1911 in Champagne, must be attributed to the excessive drought and heat in July. The investigator found the caterpillar in large quantities on black currant and *Galium Mollugo*. This caterpillar lives also on the woody parts, and when young, can in certain cases, make its way direct from the egg into the grape without appearing on the exterior.

As regards arsenical insecticides, M. Chatenay has observed that they act very slowly upon the caterpillars and sometimes only destroy them at the last stage of their development.

He recommends as a very important measure for the destruction of *Conchylis*, the sorting of the grapes at vintage-time, unless the latter is very late, and states that, with few exceptions, wherever layering of the vines is practised, *Conchylis* is almost completely absent,

Mr. Feytaud, chief of the Bordeaux Station, has studied the action of insecticides and climatic conditions on the eggs of *Conchylis* and *Eudemis.* He has found that nicotine does not hinder the development of the embryo, but causes the death of the young caterpillar before it leaves the egg and at the moment of hatching.

Cupric mixtures kill the egg during its development. The action of sunlight is also efficacious, for, not only are there fewer eggs upon the bunches which are exposed to the sun than upon those growing in the shade, but the light arrests the development of the eggs and kills the young caterpillars ; hence the value of stripping the leaves.

Mr. Feytaud has also proved that nicotine and pyridine (the last in a lesser degree) assist, even after having been applied for some days, in keeping the moths from the grapes, by hindering to a great extent, the deposition and the development of the eggs, and by killing by external or internal action a large number of caterpillars Experiments carried out in the fields, showed the efficacy of nicotine added to cupric mixtures, to soap or to molasses. Pyridine, when used early and in very strong doses (1.5 %), is equally good, and less expensive.

Mr. Feytaud also states that great summer heat and drought caused the almost complete disappearance of the second generation of *Conchylis* He also found again in the neighbourhood of Bordeaux the egg parasite (*Oophthora semblidis*) (1), which M. Marchal had discovered near Beaune, and made observations upon other natural enemies belonging to the Hemerobiidae (Lace-wing Flies) whose larvae killed the *Conchvlis* and *Eudemis* caterpillars.

Mr. Paillot, Chief of the Beaune Station, especially observed in Burgundy, a great variability in the chief date of egg-laying (8-10 days) in the case of vines near each other, but having different exposures and growing at various elevations. This circumstance naturally makes it difficult to fix the exact date for treatment in a given district, and explains, why operations carried out at the same time, and with the same care, have given very various results.

He observed the presence of *Conchylis* upon different species of shrubs, especially dogwood ; bushes also serve as a shelter for the moths, so that vines growing near them are most subject to the attacks of the insect.

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(1) See *B*. Nov.-Dec. 1911, No. 3263

Mr. Paillot also found that there was sometimes an interval of nearly a day between the hatching of the caterpillar and its penetration into the grape. The same fact has been established by the writer in the case of *Conchylis*.

Mr. Paillot also studied the natural enemies of *Conchylis* especially one of the Hemiptera, which destroys the caterpillars. The more the vine stocks are covered with earth, the greater is the number of the chrysalides which are attacked by fungus parasites.

Lastly, Mr. Paillot made some experiments with washes having arsenate of lead and pyrethrum as bases, and the different methods of using them.

In the course of his biological researches, Mr. Picard, Chief of the Montpellier Station, was able, amongst other things, to prove the occurrence of Eudemis on certain wild plants, especially *Daphne Gnidium*, without any infection of the neighbouring vines. With regard t natural auxiliaries, he found that *Pimpla* attacks only the second generation of *Conchylis*, so that spring treatments are better than summer ones, as they do not hinder the propagation of the *Pimpla*. He also observed in the district of Aigues-Mortes, that the submersion of the vineyards did not suffice to prevent the spread of *Conchylis*, and that watering carried out in July, in the low part of Gard, favoured the development of the second generation which was unimportant elsewhere. This is due to the fact that the presence of water is necessary for the laying of the eggs. Delay in the vintage, even for two days, may have disastrous effects and allow of an enormous number of *Conchylis* remaining in the vineyard, which would otherwise have been destroyed.

Wine-traps have yielded very satisfactory results in Hérault, and the females captured were in excess of the males, the reverse of what occurred in the case of lamp-traps. In the S. of France, it appears that winter treatment and preventive cultural methods are chiefly to be advised.

Mr. Vezin, Chief of the Blois Station, has found amongst other things, that captive moths are only able to deposit their eggs, if water is sprinkled morning and evening.

He further made a list of the varieties of the local vines which are most resistant to the *Conchylis*. He considers that lamp-traps and liquid traps are very efficacious, while emulsions of petroleum, distillate, oil, and carbon disulphide are not.

The Entomological Station of Paris has been chiefly engaged in collecting the data of the chiefs of the various temporary stations, in order to be able to draw up a definite report. The information is obtained from monthly reports, and chiefly from schedules bearing numbers corresponding to an analytic table. The researches made directly by the Paris Station resulted in the discovery of *Oophthora semblidis* (already mentioned as an egg parasite of *Conchylis* and *Eudemis*) and of *Eulophus* sp. an internal parasite of the Eudemis caterpillar. Mr. Fron found, in the material sent to him by the Station, a new fungus parasite of *Conchylis*, *Spicaria verticilloides*. *S*. (*Botrytis*) *Bassiana* was also found very useful in the control of *Conchylis*. The Station intends prosecuting its researches in this direction.

Mr. Marchal has made, in the neighbourhood of Paris, observations on the life-history of *Eudemis* and *Conchylis*, and studied especially the first phases of development of these insects.

The insecticides which he found the best, are those with nicotine and pyrethrum. The nicotine proved itself especially efficacions in acting directly upon the eggs at the hatching out of the caterpillars. Pyrethrum, associated with soft soap, seems to be the best insecticide for use during the time when the larvae are destructive. Researches have further been made at the Paris Entomological Station in the preparation of insecticides, some of which have given encouraging results, but the matter still needs further investigation.

Lastly, Mr Marchal has made a tour of inspection, visiting the different temporary stations, thus being enabled to make further observations on the egg parasites of *Conchylis* and *Eudemis* and on the general life-history of these insects.

724
German
East Africa

The Control of the Diseases and Insect and Other Pests of Cultivated Plants at the Imperial Institute of Agricultural Biology at Amani, German E. Africa. — See above, No. 612.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

Injury to Root Plants by Frost in Russia. — See above No. 652. 725 **Russia**

NASINI, R., CUBONI, G., MATTIROLO, O. **On a Case of Chronic Poisoning of Fruit Trees by Factory Smoke** (Experts' Report). (Sopra un caso di avvelenamento cronico di piante da frutto prodotto da emanazioni gassose di stabilimenti industriali). *Perizia giudiziaria.* — 4 to., pp. 82 + 3 tav. Torino, Vincenzo Bona, 1911. 726

An interesting contribution to our knowledge of the alterations in plants caused by chronic poisoning by sulphur dioxide, has been made by some recent researches on the injury suffered by " chinotti " (*Citrus sinensis* Risso) growing near a factory in the neighbourhood of Savona. **Italy**

All vegetation on the farms in the vicinity of this factory bore very evident signs of wasting away, while its appearance improved as the distance from the smoke-producing centre increased. The plants that suffered most were the trees, that is, the citrus fruits, and the common fruit trees, such as peaches, pears, plums, grapes etc. Many " chinotti " and fruit trees had withered down to the insertion of the graft, and only some shoots from the stock were still alive. The vines were stunted; they had but few canes, their internodes were short and but few bore fruit. Among herbaceous plants, tomatoes showed most the deleterious effects of the smoke; their leaves were curled, pale and partly withered. The greater part of the pods of horse beans had turned brown and were abortive. The least injury was that done to the spontaneous herbaceous plants, among which only a few, and of a limited number of species, showed a paler foliage.

On examination, it proved that the above mentioned injuries were not due to the deposition of minute carbon particles from the smoke, nor to the action of vegetable or insect pests, nor to frost, wind or the nature of the soil.

On the contrary, both botanical and chemical analyses have shown that the mischief is due to chronic poisoning by the sulphurous vapours emitted by the neighbouring factory, in which 200 tons of coal are distilled daily for the production of sulphate of ammonia, benzol, tar etc. The gases issuing from the chimney contain 0.04 to 0.08 % of sulphur dioxide according to the greater or lesser quantity of air allowed to enter the furnaces.

The injuries observed on the " chinotto " plants are the following : The leaves, though still retaining their normal exterior morphological characters show a lower tone of colour, a yellowness of the edge of the lamina corresponding to the region of the hydathodes and a diminution in the activity of transpiration. These leaves easily drop off, leaving bare twigs which gradually dry up. This withering extends rapidly to the thicker branches until it causes the death of the whole plant, which however tries to react by the production of new buds, the first few of which may even develop, but the succeeding ones end by drying up and falling off.

Corresponding to the exterior appearance of the plants, examination under the microscope reveals a gradual discoloration of the chlorophyll granules, a yellowness of the plasma, and the final dissolution of the granules in the plasmic mass which gradually assumes a more intense yellow brown colour.

The considerable depressions in the tissue, accompanied by buckling of the cell walls, which are produced by the direct action of sulphur dioxide in cases of acute poisoning, were not observed.

The gradual decoloration of the chlorophyll granules and the alteration of the " chinotto " leaf plasms have been experimentally produced in the laboratory, as well as the characteristic spots, due to the direct action of sulphur dioxide on the leaves of apple, pear and service trees.

Vine leaves do not present these typical spots; they show generally a lower tone of colour, and a yellowness which increases from the edge towards the centre of the leaf.

Treating the leaves with methyl green, Congo red or barium chloride gave negative results, as was to be expected, this being a case of chronic poisoning due to minute quantities of sulphur dioxide.

On the other hand interesting results were afforded by investigating the effects of the poisoning on the metabolic processes, with a view to ascertaining the moment in which the plants begin to feel the first injurious effects of sulphur dioxide. The comparison between the branches of sound and diseased plants bore on the growth of the various annual wood rings.

The principal facts observed on " chinotti " (branches and trunks) as well as on oranges, lemons, pears, and peaches are the following :

1) The diameters of the branches of healthy plants were always considerably greater than the corresponding branches of the same age of sickly trees.

2) The annual woody rings, of the same age both in the branches and in the trunks, were thinner in the sickly plants than in the healthy ones.

3) The effects of frost (1907-1908) were shown by the thinness of the rings of growth, both in the healthy and in the sickly plants.

4) An examination of the rings of growth showed that the decline of the plant did not take place suddenly, but that it was the result of a slow, progressive cause. The same examination rendered it possible to establish, with a certain approximation, the period of vegetation in which the plant began to waste away.

The method followed in these examinations was founded on a number af observations and measurements made in the direction of several radii of the wood, so as to reduce the possible causes of error to a minimum.

The results obtained are summarized in diagrams representing the curve of the production of wood, and the ratio of the various annual rings of wood growth.

These results of botanical analysis are corroborated and completed by the chemical analyses which investigated the composition of the leaves and branches of healthy and of injured trees, the content of sulphates in the soil, and the constituents of the air near the factory.

The determination of the sulphate content of the leaves and branches collected at the same time in the areas of the healthy and of the damaged trees gave the following results, per 100 parts of leaves and branches.

	Quantity weighed for analysis	Barium sulphate	Sulphuric acid %
Healthy leaves . . .	10.39	0.2530	1.02
Injured leaves. . . .	14.53	0.7953	2.29
Healthy branches . .	12.77	0.1512	0.497
Injured branches . .	11 57	0.3514	1.275

on 100 parts of ash.

	Ashes per 100 parts of leaves	Carbon residue in 100 parts of ash	Sulphuric acid in 100 parts of ash
Healthy leaves. .	20.63	0.1887	3.30
Injured leaves. . .	27.50	0 1939	7.—

Calculating from the foregoing data, the amount of sulphuric acid contained in 100 gr. of leaves (*i.e.* in 20.63 of ash from healthy leaves and in 27.50 of ash from injured leaves) was found to be·

Sulphuric acid in healthy leaves . .	0 68 %
» » injured leaves . .	1 925 %

And, by direct determination, after oxidation by means of nitric acid and calcination in the presence of nitre and of an alkaline carbonate :

Sulphuric acid in the healthy leaves	1.02 %
» » » injured leaves . .	2 29 %,
The two differences. . . .	1 02 — 0 68 = 0 34
and	2.29 — 1.925 = 0.365

give the amount of sulphuric acid corresponding to the sulphur contained in the leaves under the form of volatile organic sulphur or of sulphides, or, more probably it is reduced to the form of sulphide by the carbon during the process of incineration and then given off as sulphuretted hydrogen on treatment with hydrochloric acid.

This sulphur, when treated with nitric acid and then with nitre in the presence of an alkali, was oxidised and transformed completely into sulphate.

From the above it is clear that the injured plants have a higher content of sulphates than the healthy plants.

The quantities of sulphates present in the soil on which the injured plants grew, and in that occupied by the healthy ones were found to be as follows :

Sulphuric acid, fine soil, healthy plants . .	0.168 %
» » » injured plants . .	0.143 %

The numerous experimental data regarding the concurrence of injury by sulphurous vapours with an increase in the amount of sulphates contained in the leaves and branches leave no doubt as to the interpretation to be given to the above analyses.

In this case the greater amount of sulphates found in the soil occupied by the healthy plants precludes any objection based on the possible influence of the soil.

The results were the following:

In the most damaged area in the immediate vicinity of the factory, the concentration of sulphur dioxide was found to be about 1 : 27 000. In other tests: 1 : 70 000, 1: 90 000, 1 : 400 000 according to the distance from the factory, the velocity and direction of the wind.

At the borders of the uninjured zone the concentration was found to be 1 : 600 000. Traces were found in a soil on which vegetation showed no signs of having suffered. As it has been demonstrated by experiment (Wislicenus) that sulphurous vapours begin to be deleterious at a dilution of 1 : 200 000, it is evident that the concentration found near the factory was well within these limits.

As a protection against this mischief, the dilution of the vapours within the factory chimneys is recommended. This may be obtained either by raising their height, or by the installation of apparatus for the artificial dilution of the gases on their issuing into the atmosphere.

SABACHNIKOFF V. **The Action of Sulphurous Acid on Pollen.** (Action de l'Acide Sulfureux sur le Pollen). — *Comptes rendus hebdomadaires des séances de la Société de Biologie.* — Tome LXXII, No. 5, pp. 191-193. Paris, 9 février 1912. **727**

France

It is well known that the smoke from certain factories has an njurious effect upon fertilization and upon the formation of fruit.

Studying specially the action of sulphurous acid on pollen, the writer has shown that in an atmosphere saturated with sulphurous acid the pollen of the following plants was killed after 3 to 5 minutes: *Helleborus viridis, H. orientalis, Hepatica triloba* (*Anemone Hepatica*), *Galanthus nivalis, Primula officinalis, Vinca minor. V. major, Convallaria majalis, Narcissus poeticus, Caltha palustris, Cytisus Laburnum, Viola tricolor, Orchis maculata, Billbergia, Eranthis, Crocus.*

Very small amounts of this acid do not often kill the pollen, but the pollen-tube grows abnormally, usually remaining short and taking an irregular form.

This has been proved by the writer in the cases of:

Anemone Hepatica, Billbergia, Helleborus orientalis, Vinca minor, Viola tricolor, Primula officinalis, Lilium candidum, Petunia, Pisum.

The concentration of the sulphurous acid varied from 1 per 1000 to 1 per 300 000, and the duration of its action upon the pollen, from 3 to 48 hours.

It was ascertained that the germinating property of the pollen remained unimpaired after an exposure of 1 to 48 hours to sulphurous acid with a concentration of 1 per 48 000. The germinating property of such pollen is, however, nearly always destroyed, if the latter is exposed for three hours to the action of acid with a concentration below 1 per 13 000.

It may be assumed that sulphurous acid at 1 per 13 000 in ordinary air acting for 24 hours is the fatal limit for the pollen of the plants experimented with.

Pollen which has been exposed to toxic action, and not killed, is capable of germinating in an abnormal manner.

728 REITMAIR O. **Biological Studies of Leaf-Curl in Potatoes.** (Biologische Studien über die Blattrollkrankheit der Kartoffel. Mitteilungen des Komitees zum Studium der Blattrollkrankheit der Kartoffel, Nr. 4). — *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, XV Jahrgang, Heft 1, S. 1-106. Wien, Januar 1912.

Austria

The results of the researches in 1909-1910 of the Committee appointed in Austria for the investigation of leaf-curl in potatoes, are as follows:

1. The first attack of leaf-curl brings about hereditary modifications, which cause, in the descendents of these tubers, a high percentage of badly developed plants.

2. The offspring of infected plants in addition to retarded development, usually also show external symptoms of the disease.

3. The degeneration is hastened when the vegetative conditions are unfavourable.

4. Amongst the varieties cultivated, Magnum Bonum is most liable to the attack of this disease.

5. The size of the tubers is no guide as to their healthiness or suitability as seed.

6. The equal part played by the eyes of the tubers and the shoot-buds above ground, in the spread of the disease, seems to exclude the presence of any organism which transmits the disease by means of the tubers.

7. From the experiments which have so far been made, it seems probable that in addition to the primary stage of the disease, there are two different secondary stages, one of which is inherited

without the intervention of a fungus, and the other due to a second infection by a fungus.

8. It has been impossible to cause symptoms of leaf-curl in the offspring of healty plants either by means of weakening the seed potatoes in every possible way, or exposing them to unfavourable developmental conditions.

BACTERIAL AND FUNGOID DISEASES

BACTERIAL DISEASES.

SCHUSTER, JULIUS. **Potato Rot Caused by Bacteria**. (Zur Kenntniss der Bakterienfäule der Kartoffel). — *Arbeiten aus der K. Biologischen Austalt für Land-u. Forstwirtschaft*, VIII. Band, 4. Heft, S. 452-492, Taf. 1, Abb. 1-13. Berlin, 1912. 720

Germany

In the investigation of the causes of potato rot (" Kartoffelfäule ", " Nassfäule ") the following pathogenic factors must be considered:

a) obligate parasites which by their own action alone can produce the disease (such as *Bacillus solaniperda*);

b) facultative parasites which can cause the disease but only with the concurrence of certain exterior agents (as *Bacterium fluorescens*, at 35° C.);

c) saprophytes, which cause rot only in dead tissues (as *Bac. amylobacter*);

d) habitual parasites (constitutional) transmissible, and differentiated from the harmless saprophytes (as *Bact. xanthochlorum*).

The symptoms caused by these bacteria are multiform:

a) some cause only the rotting of the tubers (Knollenfäule), as, for example *Bac. solaniperda*;

b) others produce besides a soft rot of the stalks (Weichfäule des Stengels), but without decoloration (*e. g. Baot solanisaprum*);

c) others again besides the rotting of the tubers, and of the stalks, cause also necrosis of the tissues (Schwarzbeinigkeit) without decoloration (*e. g. Bact. xanthochlorum, Bact. phytophtorum*).

Bact. xanthochlorum n. sp. is probably derived from the harmless saprophyte *Bact. fluorescens*, from which it has differentiated itself in the course of evolution under the prolonged action of high temperatures.

Owing to the transmissibility of the pathogenic characters which it has acquired, *Bact. xanthochlorum* represents a « fixed » species, which by infection, through wounds, causes: the wet rot of potato tubers (Nassfäule der Kartoffelknollen), the blackening of the lower part of the stem (Schwarzbeinigkeit) of *Vicia Faba*, the soft rot of the stem (Weichfäule des Stengels) of *Lupinus nanus*, without decoloration; and by infection through the stomata produces the blackening of the leaf veins (Schwarznervigkeit) and the black spots (Schwarzfleckigkeit der Blätter) on the leaves of *Vicia Faba*.

Bact. xanthochlorum produces a series of enzymes which act in conjunction or one after the other: *a*) trypsinic protease which peptonizes proteins and gives as a final results amines and ammonia;

b) a hemicellulase which decomposes the median lamellae, formed of hemicellulose, of the parenchyma cells of the tuber;

c) an amylase which transforms starch grains into amylodextrin;

d) a tyrosinase which causes the blackening of the rotting stems of *Vicia Faba*.

The pathogenic effect of the bacterium is due to the action of a toxin which kills the protoplasm, and to the enzymic action of the specific hemicellulase of *Bact. xanthochlorum*.

The rot in potato tubers appears only after wounds; infection through the lenticels has never been observed.

Bact. phytophtorum Appel always causes blackening of the stems, in consequence of infected tubers having been used as seed, or of the stem having been wounded, with or without the assistance of animals as agents of transmission.

Bact. atrosepticum van Hall, should not be considered as the primary cause of the blackening of potato vines, as it produces only a dry rot of the tubers.

The degree of resistance of the host to the attacks of the bacteria is proportional to the rapidity with which wounds heal. The most resistant varieties are those in which, within 24 hours a continuous layer of corky substances forms beneath the wound

As for means of control, the following are recommended:

1. Avoiding too high a temperature in the store houses, all danger of infection ceasing below 8° C. (46. 4° F.).
2. Keeping the store houses well ventilated and dry.
3. Removing all diseased or damaged tubers.
4. Avoiding too abundant manuring with guano, nitrate of soda, common salt and lime, which favour the development of bacteria, and using instead phosphates, superphosphates and sulphate of ammonia.
5. Uprooting all diseased plants.
6. Carefully selecting resistant varieties.

FUNGOID DISEASES.

GUSSOW, H. T. **Rust in Grain.** *Department of Agriculture. Report of Experimental Farms for year ending March 31st, 1911.* Ottawa; Canada, pp. 257-258. **780**

Canada

Cultivated grasses, varieties of grain and practically all wild grasses are subject to rust disease. Several types of rust may be distinguished. The commonest type " Black Rust ,, (*Puccinia graminis*) occurs on leaves of wheat, rye, oats, and less frequently, barley. Other varieties are " Brown Rust ,, (*Puccinia Rubigo-vera*) and " Crown Rust ,, (*Puccinia coronata*).

It has been proved that rust fungi leave, during some period of their life, the plants on which they originally grew; also that the propagation of the rust fungi is not altogether dependent upon this change of host. This state of affairs renders preventive measures exceedingly difficult.

The prevention of rust diseases would be comparatively easy, if the fungi had to depend for their livelihood entirely upon the secondary hosts. The destruction of these plants would mean an easy solution of the rust problem, but, as it is, this extermination is only one factor in the prevention of rusts. This means of prevention should not, however, be neglected. Seed treatment is of no use whatever as regards rust prevention. It is useful, in the first place, to plough the stubbles of rusted grain immediately after harvest. Grasses, such as the common couch-grass, which serves as a primary host for black rust, should be vigorously exterminated. Further, it is of importance to sow the winter grains as late as possible, while spring grains should be sown as early as possible According to experience, this practice has resulted in minimizing the severity of rust epidemics. The mechanical or physical condition of the soil does not seem to influence an outbreak of rust; observations have shown that the disease may appear in the same degree on all kinds of soils. On the other hand, it has been repeatedly proven that the chemical condition of the soil plays an important rôle. The use of nitrogenous manures of any kind should be avoided; their use appears to favour the development of rust fungi, while on the other hand, phosphates have shown a very favourable rust-preventing influence. While these observations are worthy noting, the most important factor to reduce the enormous losses due to rust diseases is undoubtedly the use of seed grain obtained from crops free from rust. Some varieties of grain are more subject to rust attacks than others, and in some years the virulence of rust varies greatly in different localities. Farmers should endeavor to ascertain when buying seed grain whether it was obtained from crops free from rust. There are indications that lead one to believe that rust resistance is a fixed character and that crops grown from rust-proof parent stock are far less liable to be attacked.

781 FRON, M. G. **Contributions to the Study of Straw Blight of Cereals** (1). (Contributions à l'Étude de la Maladie du Pied noir des Céréales, ou Maladie du Piétin). — *Annales de la Science Agronomique française et étrangère*, 29e année, No. 1, pp. 3-29, Pl. I-III. Paris-Nancy, Janvier 1912.

France The disease of straw-blight has been attributed to the action of two special fungi *Ophiobolus graminis*, and *Leptosphaeria herpotrichioides*.

From the examination of numerous specimens of infected stubble from various districts of France, the writer ascertained that this *Leptosphaeria*, which was abundant, was the cause of the malady. He therefore directed his attention chiefly to the study of *L. herpotrichioides*, with the intention of making a biological study of the species.

The disease makes its appearance in May and the beginning of June and, after this, spreads rapidly. Its presence is shown by a felt-like formation on the surface of the stalks due to the mycelium.

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(1) See *B.* Dec. 1910, p. 360. (*Ed.*).

The affected portions of the stalk assume a grey colour and wither. The plant continues growing but in a feeble manner and, when the ears are formed, it is easily lodged.

The mycelium penetrates into the interior of the cells, localizing itself especially in the vicinity of the vascular bundles. In September, and sometimes earlier, the fructifications of the fungus make their appearance on the stubble. The perithecia, which are black in colour, usually occur between the surface of the stalk and the leaf-sheath of the last, or penultimate, node. When mature, the perithecia penetrate the stem which is already withered, and the ends of the beaks, which are more or less elongated according to the conditions of development, appear outside. Until the perithecia are completely mature, asci and paraphyses are to be found within them, but when these bodies are ripe in November and December, they contain only a mass of spores. From January and February onwards, especially if the winter be cold and dry, the perithecia remain entirely empty. The mycelium, however, continues developing in the tissues of the host, and in the following year, at about the same date as before, gives rise to a still larger crop of perithecia than that of the previous year. The writer assumes that a type of fructification must exist however, suitable for the propagation of the fungus at the beginning of the summer. He thinks the conidia attributed to a new *Cercosporella* (which he names provisionally *C. herpotrichioides*), collected in May 1909 on Japhet wheat, are the summer fructifications of *L. herpotrichioides*.

With regard to the conditions which are favourable to infection by this fungus, the writer's experiments show that, when the young plants first come up and are only a few centimeters in height, infection easily takes place by means of the spores which escape from the perithecia.

The negative result of experiments made upon older wheat plants makes it probable, though not certain, that the latter are only subject to infection during their early stages of development, and in any case, it appears that infection at a later period is rarer and dependent upon special conditions.

The incubation period of the disease is very long and includes all the time which elapses until the disease is signalised by the external signs of lodging and a black discoloration appearing at the base of the stalk. Mr. Fron has also demonstrated that this fungus can only develop in the presence of alkaline, or at least, neutral substances. In a slightly acid medium its growth is arrested.

The spores retain their vitality for a long time, as long as they are enclosed by the perithecia, on escaping from the latter, they germinate rapidly under suitable conditions, but otherwise they very soon die.

From the resistance shown by the spores to solutions of iron and copper sulphates, the writer shows that the former compounds are much less active than the latter it requires a 0.5 $^{0}/_{00}$ solution of iron sulphate to hinder the germination of the spores.

The spores lose their vitality also if exposed to light, especially sunlight, and in dry air.

In the case of ground which is much subject to this disease, the writer recommends delaying sowing, even to the end of the winter (end of January or February), and also using for this reason certain varieties of wheat.

Another precaution is thin sowing, so as to reduce humidity and to allow of light and air reaching the base of the stalks, thus hindering the growth of the mycelium. In sowing in drills, it is advisable to have the rows at unequal intervals, every two being close together.

The writer does not go into the question of the best varieties for cultivation, but he draws attention to the fact that it has repeatedlly been observed that early varieties are the most prone to to the disease in question.

782 GAIN, EDMOND **Infection of Forage Grasses by Ergot.** (Sur la contagiosité de la maladie de l'ergot chez les graminées fourragères). — *Comptes rendus hebdomadaires des séances de la Société de Biologie*, Tome LXXII, No. 5, pp. 189-191. Paris, 9 Février 1912.

France

The writer undertook to determine, by experimental means, whether the infection of forage grasses with the spores of *Claviceps purpurea* is brought about by insect agency only, as seemed likely from the previous work of L. Mercier.

After having collected from the inflorescences of *Holcus mollis*, a certain quantity of " honey-dew ,, containing conidia (*Sphacelia*) of the fungus, he infected thirty specimens of *Lolium perenne, Arrhenatherum elatius, Phleum pratense* and *Holcus lanatus*. Some of the " honey-dew ,, was used in its natural condition, and some after having been diluted with water.

In less than a month after infection, the disease made its appearance on all the above mentioned plants, soonest on ***Phleum;*** the sclerotia of the fungus appeared on the places where the conidia had been sown.

The neighbouring plants, which had not been inoculated, were, as a rule, perfectly healthy; in any case, the diffusion area of the fungus was limited to 30 cm. (11.8 inches).

This shows that mechanical transport or contact is sufficient for the spread of the disease.

The action of the wind and the accidental agency of insect visitors (without specific commensalism) is all that is required to bring about the occurrence of the malady.

It has not been proved that the conidia retain their power of infecting grasses after they have passed through the digestive system of insects.

788 von Istvánffi, Gy. and Pálinkás, Gy. **Infection Experiments with Vine Mildew.** (Infektionsversuche mit *Peronospora*). — *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten,* II Abt., 32. Bd., No. 20-25, S. 551-564. Jena, 6. Februar 1912.

The writers have carried out numerous infection-experiments with vine mildew.

Hungary

On the leaves of large shoots removed from the plant, infection takes place readily and surely, while the cells remain turgid and the leaves are in an atmosphere containing 90 % of the relative moisture of the air and at a temperature of 20 to 22° C. On the fourth day after inoculation a few conidiophores appear on the under surface of the leaf; on the upper surface no sign of infection shows after ten days.

Experiments in the open, under natural conditions, were made in all kinds of weather — damp, rainy, dry, and very hot. The characteristic leaf-spots appeared in a large percentage of the infected places. Infection also took place on the upper surfaces of the leaves, though less readily and less often than on the lower.

The minimum incubation period was 5 ½ to 7 days, and the maximum 14 to 16 days; but the mycelium may retain the faculty of developing for 3 to 4 or even 7 weeks.

Grapes removed from the plant, like leaves of cut shoots, showed traces of infection after four days. Grapes on the vine, under natural conditions, showed the disease in 12 to 14 days.

Infection on the receptacle of the grape showed in 12 to 13 days, at the base of the pedicel in 14 to 15 days, and on the main stalk, 1 cm. rom the base of the pedicels, in 17 to 18 days.

The end of the incubation period is determined by the appearance on the leaf of a greyish-green spot — " Ölfleck " in German.

The writers describe changes in the leaves consequent on the attack of the fungus, and various points connected with the conidia and conidiophores. They further state that there is a distinct relationship between the water-content of the host plant and its susceptibility to infection.

784 RAVAZ, L and VERGE, G. **Vine Mildew and the Necessary Time for Infection.** (1) (Mildiou sur le temps nécessaire à la contamination). — *Le Progrès agricole et viticole,* 29e Année, No. 7, pp 195-196. Montpellier, 18 Février 1912.

France Experiments made by the writers show that, under suitable conditions, vine leaves become infected if the fresh conidia of *Plasmopara viticola* remain in the water upon the lower surface of the leaves for an hour and a half at most.

785 RAVAZ, L. and VERGE, G. **The Influence of Temperature on the Germination of the Conidia of Mildew.** (Influence de la Température sur la Germination des Conidies du Mildiou). — *Le Progrès Agricole et Viticole,* 33e Année, No. 6, pp. 170-177, 3 fig. Montpellier, 11 Février 1912.

France Since 1876 many experiments have been made with the object of studying the germination of the conidia and the zoospores of *Plasmopara viticola,* but hitherto without any attention being paid to the question of temperature and its effects.

The result of these researches shows that the evolution of conidia into zoospores is extremely rapid at all temperatures in which the vine can grow, in rainy as well as foggy weather. The optimum temperature for their germination appears to be 25° to 27° C. (77° to 80.6° Fahr) Above this the number of germinating conidia rapidly declines, and reaches zero at 35° C (95° Fahr.).

Also the zoospores germinate at low temperatures (from 6.5° C., or 43 7° Fahr upwards) like the conidia.

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(1) See *B.* Feb. 1912, No 419. (*Ed*).

SCHNEIDER-ORELLI, O. ***Gloeosporium fructigenum* in Central Europe and North America.** (Zur Kenntniss des mitteleuropäischen und des nordamerikanischen *Gloeosporium fructigenum*). — *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten.* II Abt., Bd. 32, No. 13-19, S. 459-467. Jena, 27. Januar 1912. **786**

Switzerland. United States

From comparative researches made by the writer on *Gloeosporium fructigenum* from Switzerland and the United States, there are evidently differences, from a physiological point of view, between the European and American forms.

In America, the fungus lives in the hotter zones and its optimum temperature for growth is about 5° C. (9° Fahr.) higher than that of the European form.

Further, this *Gloeosporium* in Europe is a much less active agent of putrefaction than in America, where it develops greatly on the youngest and immature apples and destroys the crop at an early date. The European form has never hitherto been observed to be the cause of canker of the branches of apple-tree, and experiments of artificial infection of living branches have given negative results.

In America, on the contrary, the fungus in known both as the cause of decay in apples and of apple-tree canker.

EWERT, R. **On the Biological Significance of the Difference in Cold-Resistance of *Monilia cinerea* and *M. fructigena*.** (Verschiedene Uberwinterung der Monilien des Kern und Steinobstes und ihre biologische Bedeutung). — *Zeitschrift für Pfanzenkrankheiten,* Jahrg., 1912; XXII. Band, Heft 2, S. 65-86. Stuttgart, 10. Februar 1912. **787**

Germany

The researches of the writer have yielded the following results:

1. The spores of *Monilia cinerea* can pass the winter on the mummified fruits of the cherry, morello and plum, and they retain their germinating capacity and power of infection unimpaired. The same thing occurs if the *Monilia* by chance develops upon hard fruits.

2. The spores of *M. fructigena* generally lose their power of germination as soon as winter sets in, even if the fungus is growing upon a plum-tree.

3. Under the influence of damp heat, *M. cinerea* gives rise to new spores more easily than *M. fructigena*; it is always capable of causing infection and is a parasite more adapted to stone-fruits,

which flower early, than is *M. fructigena*, which makes its appearance later.

4. The power possessed by the spores of *M. cinerea* of surviving the winter, does not only depend on their great resistance to cold, for the spores of *M. fructigena* can also stand very low temperatures without their germinative property being affected.

The different behaviour must be considered as a peculiarity of each of these species, which are so nearly allied from the biological stand-point.

788 BRUSCHI, DIANA. **Enzyme Action of certain Fungi parasites of Fruits.** (Attività enzimatiche di alcuni funghi parassiti di frutti). — *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fis., matem. e nat.*, Vol. XXI, 1° sem. No. 3, pp. 225-230 e No. 4' pp. 298-301. Rome, 4-18 Febbraio 1912.

Italy

The writer has studied the toxic action of three fungi, *Fusarium niveum, F. Lycopersici* and *Monilia cinerea* on the cells of the fruits which they attack (marrow, tomato, plum) and found that it was not proportionate to the acidity of an extract of the fungus, and disappeared for the most part on cooking. None of the three fungi secrete cellulase (an enzyme which decomposes cellulose); *F. niveum* and *M. cinerea* secrete a pectinase, which liquefies the middle lamella of the cell walls of the fruit, producing a rapid maceration. It is doubtful whether *F. Lycopersici* forms pectinase.

The three fungi contain proteolytic enzymes, which break up the proteins of the fungus, as well as those of the fruits. The pulp of the fruits in autolysis digests its own albumens, but if the juice of both is mixed, a great diminution in proteolysis is observed, or an increase in albumen formation.

It appears, from indirect methods, that we have here, in all probability, a synthetic action produced by the fungus at the expense of the nitrogenous compounds of the fruit.

While *F. niveum* and *F. Lycopersici* use up rapidly their own carbohydrates, as well as those of their host, *M. cinerea* uses up more of its own carbon reserves, in autolysis, than of the sugars of the fruit.

RESISTANT PLANTS.

739 BONDARZEV, A. C. **Disease Resistant Varieties of Peach in the Caucasus.** (Grobneia Boliesnia Persika. Vstrieciaiustciiasia na Cernomorskom Poberejie Kavkasa), — *Jurnal Boliesni Rastenii*, (Journal of Plant Diseases), V. God. No. 5-6, pp. 134-135. S. Peterburg, 1911.

This is a short note on the principal diseases which attacked peach-trees in the Caucasus in 1911, and is especially interesting from the fact that it enumerates the varieties which are resistant to different diseases. **Russia: Caucasus**

1. *Exoascus deformans* Fck., has become a veritable scourge; it attacks all varieties indiscriminately, but especially Elberta and Celestial Empire; the early American varieties, Amsden, etc., show a greater power of resistance.

Cercospora cerasella Sacc. attacks especially the variety *Persica foliis atropurpureis* causing the appearance of the characteristic spots on the blade of the leaf. The following varieties are partly immune: Korol Posdnikh (lit. king of the lates), Double Montagne and Early Alexander. Wonderful and Elberta are wholly immune.

Puccinia Pruni-spinosae Pers. causes the withering and fall of the leaves, and chiefly attacks Celestial Empire and Brusskii which it injures most, and Early Alexander, Elberta, etc., which suffer less. Korol Posdnikh, Double Montagne and Wonderful can be considered as resistant.

Amongst other more wide-spread and serious diseases, must be mentioned those due to the attacks of *Sphaerotheca pannosa* Lév., *Monilia fructigena* Pers. and *Cercosporella Persicae* Sacc.

740 WEHMER, C. **The Resistance of Oak Wood to Dry Rot.** (1) (Resistenz des Eichenholzes gegen Hausschwamm). — *Berichte der Deutschen botánischen Gesellschaft*, Band XXIX, Heft 10, S. 704-708, 1 Abb. im Text. Berlin, 25. Januar 1912.

The resistance of oak wood to *Merulius lacrymans*, though usually assumed, has not so far been discussed or experimentally proved by all those persons who have studied the question. **Germany**

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(1) See *B.* April 1911, No. 1301; Nov.-Dec. 1911, No. 3249. (*Ed.*).

Mr. Wehmer is able to prove by means of practical experiments, which have been repeated in the laboratory, that oak wood is absolutely immune from the attacks of this fungus.

He mentions, in this connection, a very instructive case: dry rot had badly attacked the wood of two rooms situated on the ground floor and which had two floors one above the other. The lower one, of conifer wood, had been entirely decomposed for two years, while the upper portion, which was of oak, though immediately in contact with the lower, had remained intact, although *Merulius lacrymans* had spread much beneath it, and had made its appearance on the outside between the interstices of the floor. After two more years, the fungus began to fructify on the external portion of the flooring and to cover with its mycelium the oak parquet which it had already displaced, in order to reach the light. None of these pieces of parquet were, however, even superficially attacked; even three or four years after the appearance of the fungus, the flooring remained sound and compact as if the wood composing it were untouched.

MEANS OF PREVENTION AND CONTROL.

741 Caors, Ch. **The Control of Vine Mildew in France.** (Sur le traitement du mildiou). — *Le Progrès agricole et viticole*, 29e année, No. 5. pp. 140-141. Montpellier, 4 Février 1912.

France: Var

At Gonfaron (Var), the writer completed in 1911 his obserations with regard to the manner in which infection of *Plasmopara viticola* commences in the vine, and the most efficacious method for the control of this disease.

A plot of vines, Carignan, was subject every year to the attacks of the parasite, and the writer, finding that the first signs of the malady appeared on the lowest leaves, directed the two first sulphurings onto the under surfaces of the leaves which grew nearest the ground. After heary rainfall " the mildew made its appearance; in all the other plots " the vines were considerably injured, but on the treated plot they were little harmed, the fungus having limited its attack, in this first invasion, to certain leaves splashed with earth, which showed a few localized patches.

Three further sulphur sprayings followed, directed chiefly upon the upper surfaces of the leaves, according to the usual practice. The crop was abundant, and far superior to those obtained on the experimental plot during the seven previous years.

In conclusion, the experimenter shows that *Plasmopara* makes its appearance, in the first place, on the under surfaces of the lowest leaves, probably as a direct result of the winter spores being carried on to the leaves by heavy rains. It is therefore necessary to sulphur before the disease makes its appearance, the under surfaces of the leaves nearest the soil being specially treated.

The later infection is due to the conidia of *Plasmopara* being transported to the upper surfaces of the leaves in the manner described by Ravaz and Verge (1) so that sulphuring the upper surfaces is a sufficient prophylactic.

VRONSKII, S. G. **Organization of the Control of Oak Mildew in the Forests of Korabel, Russia** (2). (Borba s Mutcnistoi Rosoi na Dubie v Pitomnikie Korabelnago. Liesnicestva v 1911). — *Liesnoi Jurnal* (Forestry Review), XLI G., Vip. 9-10, pp. 1439-1452. S. Peterburg, Dekabr. 1911. 742

In the forests of Korabel, in the Government of Volhynia, the oak mildew made its appearance for the first time in 1909, attacking *Quercus pedunculata*, *Q. rubra* and *Fagus sylvatica*.

Russia

The writer, who is the Forest inspector of the district, took energetic measures for checking and controlling the pest. In 1911 he commenced, according to a scheme proposed by Bondarzev, a series of experiments to show which were the most effectual methods of control.

The experiments were divided into seven groups:

1. Dusting with flowers of sulphur.
2. Spraying with lazurina.
3. Spraying with lazurina and flowers of sulphur.

In these first three cases, the treatments were carried out every 15 to 20 days.

4. Spraying with liver of sulphur every 10 to 15 days.
5. Spraying with liver of sulphur and copper sulphate every 20 to 25 days.
6. Sprinkling with " polysulphide " every 15 days.

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(1) See *B.* Feb. 1912, No. 419. (*Ed.*).

(2) See also *B.* April 1911, No. 1298. (*Ed.*).

7. Sprinkling with "polysulphide" and copper sulphate every 15 to 20 days.

In order to judge of the effect of the above-mentioned remedies upon the oak mildew, the following points must be considered.

1. The thickness of the white felt made by the parasite upon the leaves.
2. The scorching of the outer edge of the leaves.
3. The falling of the scorched leaves.

On July 16th 1911, the leaves of the oaks which had been treated with liver of sulphur were not only clearly attacked by the fungus, but many of them were scorched; those of the trees treated with liver of sulphur and copper sulphate were in the same condition.

The polysulphide prevented whitening of the leaves, but could not hinder scorching.

Much more satisfactory results were obtained by dusting with flowers of sulphur, the symptoms of the disease being confined to a slight whitening of the leaves with no trace of scorching or dying.

In agreement with these experiments, the application of flowers of sulphur, on a large scale, in the wooded districts of Korabel was attended with complete success.

748 Pinoy, E. ***Merulius lacrymans* injurious to Timber.** (Sur la conservation des bois). — *Comptes-rendus des Séances de l'Académie des Sciences*, tome 154, N. 9, pp. 610-611. Paris, 26 Février 1912.

France

In the course of some researches on the means of protecting wood from the attacks of *Merulius lacrymans*, the author found that pieces of wood immersed, until completely impregnated, in a solution containing 2 % of bichromate and 1 % of sodium fluoride, became, after drying and exposure to light, completely resistant to the action of fungi.

If then the wood is painted with a solution containing 5 % of gelatin, 2 % of potassium bichromate and 0.5 % of sodium fluoride, and again exposed to the light, it aquires, when dry, a brilliant solid polish and a brown mahogany colour that imitates old wood.

The author has also discovered that wood already attacked by the fungus may be protected from further damage by being properly disinfected and then treated as above. He believes that this process will be found useful as a protection against those insects that damage wood.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS.

744 ULE, E. ***Uredo Manihotis* injurious to *Manihot Glaziovii*** (Die Maniçoba von Cearà u. deren Beulenkrankheit). — *Der Tropenpflanzer*; 16 Jahrg., No. 2, S. 91-95. Berlin, Februar 1912.

Brazil: Ceará

In September and October 1910, while visiting some plantations of *Manihot Glaziovii* (the well known rubber tree called also "Maniçoba") in the State of Ceará (Brazil) the Author observed that the branches and twigs of many trees were much deformed by large excrescences resembling gigantic gall nuts. Further investigations enabled Mr. Ule to ascertain that these deformities were due to *Uredo Manihotis* P. Henn. which attacks also *Manihot utilis*, and which he had already found in 1892 on wild species of *Manihot* in the State of Goyaz (Brazil).

Sometimes the fungus attacks only the leaves, causing rust coloured spots; at other times it produces on the branches a kind of witches'-brooms. Probably this parasite is spread throughout the States of Ceará and Rio Grande do Norte. It causes considerable ravages, first by reducing the yield of rubber, and later by causing the death of the branches and eventually of the whole tree.

Up to the present no better method of controlling this pest is known, than the careful pruning of the trees, removing and destroying by fire all the infected parts.

745 VOGLINO, P. **Canker or Rot of Solanaceae: Egg-Plant, Capsicum, and Tomato.** (La cancrena o marcescenza delle solanacee: Melanzana, pomodoro, peperone). — *L'Italia Agricola*, anno XLIX, No. 3, pp. 56-58, 1 fig. Piacenza, 15 Febbraio 1912.

Italy

In 1908, the writer noted the withering and drying up of the leaves and fruits of the egg-plant (*Solanum melongena*) due to *Ascochyta hortorum*, which had already been observed in North America upon various *Solanaceae*.

In 1910, the same fungus occurred in France upon the stems of the egg-plant.

In the course of the year, it was discovered by the writer near Giaveno (Prov. of Turin) on tomato plants.

From the stalks and leaves, upon which cankerous brown spots appeared, the infection soon spread to the fruits which were still green, or on the point of maturing. Finally, there appeared upon these numerous cankerous, circular, black patches of which the surface was grained, and which contained brown, rotting pulp. Spraying with Bordeaux mixture proved to be an efficacious remedy.

In the absence of further experiments, the writer brings forward the hypothesis that the fungus which attacks the egg-plant and tomato may also be the cause of the withering of the capsicum which, of late years, has caused great damage in small disticts of Piedmont.

746 ELENKIN, A. A. **Two Cryptogamic Diseases of Tulip Bulbs.** (O Gribnekh Boliesniakh Lukoviz Tiulpana). — *Jurnal Boliesni Rastenii* (Journal of Plant Diseases), V. G. No. 5-6, pp. 105-124. S. Peterburg, 1911.

Russia

In May 1911, some bulbs of the tulip " Gelber Prinz ", which were affected by a fungus to the extent of 50 % of the crop being destroyed, were sent to the Phytopathological Station of the Royal Botanical Garden of St. Petersburg.

It was discovered, by means of a careful series of experiments, that this disease was caused by two different fungi. One develops in the interior of the bulb, between the scales, and gives rise to a mass of greyish or brown mycelium from which develop conidiophores having at their extremity a large number of small conidia, which may be referred to *Botrytis cinerea*. This fungus always destroys the whole interior part of the bulb and produces numerous small, black, roundish sclerotia about 1-1.5 mm. in diameter, rarely as much as 2 mm. The interior of these sclerotia is occupied by a mass of hyphae composed of numerons fine, colourless hyphae, thickly interlaced and which form round the periphery a brown involucre with a thickness of 10-25 μ.

Infection-experiments with the spores and mycelium of this fungus gave the following positive results. Both morphologically, and in the symptoms of the disease which it produces, this fungus shows so many points of resemblance to the cryptogam which attacks the common onion, that it must be considered a form of *Botrytis cinerea* Pers. It is a very formidable parasite of tulip bulbs, and is readily distinguished from *B. parasitica*, Cav.

Hitherto it has not been possible to obtain from the sclerotia higher forms of fructification.

As for the other fungus, it attacks the tissues of the base of the bulb, the floral buds, and the root. A colourless mycelium developed in the parenchyma, which produced a large quantity of sclerotia, first whitish in colour and afterwards brown, with a diameter of 1.5-2 mm., or rarely as much as 3.5 mm. The sclerotia of the roots have their origin far down in the root-tissues and, in growing, burst the epidermis and unfold in the form of small tumours 0.5-2 mm. in diameter.

Their internal structure (which consists of a mass of white, much-branched hyphae, which interlace and form a fairly loose structure) is almost identical with that of the sclerotia of the bulb, from which they only differ in the dark, almost black, colour of the superficial stratum (6-11 μ).

This fungus destroys the base of the bulb and the floral buds, transforming the tissues into a shapeless mars of sclerotia. The mode of formation of the latter greatly resembles that of *Sclerotium Tuliparum* Klebhan, but differs from it in its method of infection. In the case of *Sclerotium Tuliparum*, the disease progresses typically from above downwards, but the fungus in question first attacks the base of the bulb.

In spite of this biological difference, however, the writer admits that the fungus he has studied may be identified with *Sclerotium Tuliparum*; a more complete determination being impossible owing to its having been, so far, impossible to obtain higher forms of the fructification of either fungus. These two cryptogams usually attack different bulbs, and it is a rare occurrence for *Botrytis cinerea* and *Sclerotium tuliparum* to attack the same plant. The following methods of controlling both these fungi are advised:

1. The uprooting and burning of infected bulbs.
2. The disinfection of the soil with carbolineum in the proportion of 50 litres per are (about 2 3/4 gallons per rod).

OHL, I. A. ***Macrophoma excelsa*, form *infestans*, parasitic on *Abies concolor* in Russia.** (Ob Interesnom Gribkie na Khvoie Amerikanskoi Pikhti v Rossii). — *Jurnal Boliesni Rastenii*, (Journal of Plant Diseases), V G. No. 5-6, pp. 127-134, s 1. otd. Tabl. i 2 ris. v Tek (1 plate and 2 figures in the text). S. Peterburg, 1911. 747

The writer observed, in the district of Prilusk (Gov. of Poltava), a specimen of *Abies concolor* Lindl. and Gord. of which the greater number of the leaves had wilted and some had become quite withered. **Russia**

Numerous pustules appeared upon the leaves. At first covered by the epidermis, but later they burst through and become small black spherical pycnidia with a diameter of 250-300 μ. The walls of these pycnidia are composed of a very dense tissue, the hyphae of which are black on the outside and grey on the inside. From the internal walls, project a large number of basidia 14 μ in length and about 2.5 μ in diameter. The spores formed, are elliptical with rounded extremities, 21 to 26 μ by 9.5 to 11.5 μ, and are granular inside. From the characters of its fructifications, this fungus belongs to the genus *Macrophoma* (Sacc) Berl. and Vogl., and to the sub-genus *Eumacrophoma*, as its spores are oval and not cylindrical, as are those of the other sub-genus, *Cylindrophoma*.

The development of the disease is easily studied from the fact that green and healthy leaves occur together with infected ones Probably, we have here to do with a facultative parasite, but before being able to decide upon the matter positively, artificial infection experiments will be necessary.

The writer suggests the name of *Macrophoma excelsa* (Karst) Berl. and Vogl. form *infestans* Ohl. for this fungus.

For its control, the following measures are suggested· the use of fungicides in the spring, and the burning and removal of the infected parts in the autumn.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

748 **A *Loranthus* affecting Citrus Trees.** *The Philippine Agricultural Review*, Vol. IV, No. 12, p. 679. Manila, December 1911.

Philippines: In April 1911, in the neighbourhood of Misamis (a town in the Island of Mindanao), a parasitic plant, *Loranthus secundiflorus*, Merrill, was observed on various species of Aurantieae, especially on *Citrus decumana*. About twenty species of the genus *Loranthus* occur in the Philippines, but *L. secundiflorus* Merrill is, at present, only known there on the Island of Mindanao.

It is not improbable that, with the increase of the zones under cultivation, the parasite may become a source of great danger.

Attention has already been drawn to the damage done by this pest in India and Assam, where it has attacked pear, peach, orange, guava (*Psidium* spp.), and tea.

INSECT PESTS

GENERALITIES.

BORDAS, L. **The Morphology of the Potato Moth** (1) **Caterpillar.** (Morphologie externe et appareil digestif de la chenille de *Phtorimaea operculella* Zett., parasite de la pomme de terre). — *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, tome 154, No. 7, pp. 450-452. Paris, 12 Février 1912. **749**

France

Further researches upon the external morphology and digestive apparatus of the caterpillar of the Potato Moth (*Phtorimaea operculella*) show the great vitality of this pest; it can resist for a long time the strongest measures. Thus, after immersion in 72 % alcohol for 6-8 hours, the caterpillar is still capable of contraction and able to move different parts of its body.

This great power of resistance to asphyxiation, which depends upon its tracheal and stigmatic apparatus, explains the small amount of success with which efforts for the control of this insect have been attended, and shows that the only methods of control likely to be effective, will be those directed against the pupae and the adult moths.

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(1) See *B.* Feb. 1912, No. 437. (*Ed.*).

MEANS OF PREVENTION AND CONTROL.

750 D'HERELLE, F. ***Cocobacillus Acridiorum* as Means of Controlling Locusts in Argentina** (1). (Sur la propagation, dans la République Argentine de l'epizootie des sauterelles du Mexique). — *Comptes rendus hebdomadaires des séances de l'Academie des Sciences*, Tome 154, No. 9, pp 623-625. Paris, 26 Février, 1912.

Argentina

At the request of the Argentine government, the Author experimented with *Cocobacillus Acridiorum* n. sp. — (which he had isolated from the intestinal contents of Yucatan locusts (*Schistocerca pallens* Thumb.) — on the locusts which every year ravage a part of the territory of the Republic.

The infection experiments which commenced in December 1911, were made at first upon the migratory locusts of the Parana region (*Schistocerca paranensis* Burm). Three cages, each containing 250 to 300 locusts, were used. The first cage was infected by some lucerne which had been moistened with 20 c. c. of culture broth. All the locusts died within five days; the same result was obtained in the same time in the experiment on the locusts of the second cage, in which four locusts which had died in consequence of the injection into them of one drop of culture broth, had been placed.

In the control cage, after five days, only five dead locusts were found; they had probably been injured during transport, and they showed no trace of *Cocobacillus* which had been found, as an almost pure culture, in the intestinal contents of the locusts kept in the other two cages

These experiments having been repeated always with the same success, the Argentine government decided to infect some parts of the province of Santa-Fé.

The culture broth, in doses of about one to six pints, was poured on the ground or sprayed on some locusts, and it caused in a short time a great destruction of these pests. A few days after the first infection the disease had spread to a distance of three miles.

The propagation of the infection is possible with any species of locust.

As a consequence of these results the Government has decided to infect all the invaded territory.

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(1) See *B*. May 1911, No. 1561. (*Ed.*).

The Protection of Birds in Switzerland. (La protection des Oiseaux en Suisse). — *Journal forestier Suisse*, 27ème Année, No. 1, pp. 10-11. Berne, Janvier 1912. 751

Switzerland

Article 17 of the Federal law of the 24 th. June 1904 on game and on the protection of birds places under the protection of the Confederation the following birds: All insectivorous species, namely Warblers (*Sylvia* spp.), Wheatears (*Saxicola* spp.), Titmice (*Parus* spp.), Hedgesparrows (*Accentor*), Pipits (*Anthus*), Swallows (*Hirundo* spp.), Flycatchers (*Muscicapa* spp.), Wagtails (*Motacilla* spp.), Larks *Alanda* spp.), Starlings (*Sturnus* spp.), Thrushes and Blackbirds (*Turdus* spp.), with the exception of the Field fare (*T. pilaris*), the Redwing (*T. iliacus*) and the Mistletoe-thrush (*T, viscivorus*), the Chaffinch (*Fringilla caelebs*), the Goldfinch (*Carduelis elegans*), the Siskin (*Chrysomitris spinus*) the Serin (*Serinus serinus*), and the Citril Finch (*Citrinella alpina*) ; the Cuckoo *Cuculus* spp.), the short-toed Tree-creeper (*Certhia brachydactyla*), the Nuthatch (*Silta caesia*), the Wry-neck (*Yunx torquilla*), the Hoopoe (*Upupa epops*) and all the species of Woodpeckers (*Picus* spp.); among Corvidae the Jackdaw (*Corvus monedola*), the Alpine Chough (*Pyrrhocorax alpinus*), the Cornish Chough (*Tregilus graculus*) ; among birds of prey, the Kestrel (*Falco tinnunculus*) and all nocturnal brids of prey with the exception of the Eagle owl (*Bubo maximus*); among water fowl the stork and the swan.

There is also an International Convention for the Protection of Birds useful to Agriculture, drawn up on the 30th May 1902 and in force sinee the 6th December 1906. The birds named in the above agreement are absolutely protected, as it is made unlawful to kill them at any time of the year and to destroy their nests, their eggs or their nestlings. The States which have accepted this convention are the following: Austria-Hungary, Belgium, France, Germany, Greece, Lichtenstein, Luxemburg, the Principality of Monaco, Portugal, Spain and Sweden.

BRYANT, H. C. **Birds feeding on Butterflies.** (Distaste of Birds for Butterflies). — *Nature*, Vol. 88, No. 2207, p. 516. London, February 15, 1912. 752

United States: California

In the examination of some 40 000 stomachs by the U. S. Biological Survey there have been but few instances where birds have been found to feed on butterflies. This fact makes of still greater Interest the results of the investigation carried on by the California Fish and Game Commission with respect to an outbreak of butterflies (*Eugonia californica*) in Northern California during the summer of 1911.

During the early part of the summer the snow brush (*Ceanothus* sp.) was entirely defoliated by the work of the larvae of *Eugonia californica* in many places in the mountain districts of the northern part of California. During the latter part of July and the first weeks of August the great army of caterpillars had transformed into butterflies. These insects were so numerous that the ground was often blackened by them, and great swarms of them filled the air from morning until evening.

Field observation showed the Brewer Blackbird (*Euphagus cyanocephalus*) to be the most efficient destroyer of the butterflies, certain individuals being obserded to eat an average of five butterflies a minute. Two other birds, the Western Kingbird (*Tyrannus verticalis*) and the Western Meadowlark (*Sturnella neglecta*), were seen to feed on the insects.

Stomach examination revealed the fact that two other birds. the Blue-fronted Jay (*Cyanocitta stelleri frontalis*) and the Say Phoebe (*Sayornis sayus*), fed on the butterflies to some extent. Sixty-one stomachs in all were examined, representing twenty-one different species. Forty-five species of birds were noted in the locality where the investigation was carried on.

The most important fact brought out by the work was that birds will turn to food which is abundant and readily accessible, even though it be a little relished type of food.

758 SAVASTANO L. **Lime-Sulphur Mixture** (1) **and its Use in the Control of the Scale-Insects of Citrus Trees.** (La manipolazione della poltiglia solfo-calcica: formola della Stazione sperimentale di Agrumicoltura). — *R. Stazione sperimentale di Agrumicoltura e Frutticoltura in Acircale. Bollettino* N. 2, (2ª edizione), 9 pp., 10 Gennaio 1912.

Risultati degli esperimenti con la poltiglia solfo-calcica (formola della Stazione di Agrumicoltura) eseguiti durante il 1911 contro talune cocciniglie degli agrumi. — *Ibidem, Bollettino* N. 3, 6 pp., Dicembre, 1911.

Italy: Sicily. Campania. Calabria. Liguria

Lime-Sulphur mixtures are compounded according to very variable formulae.

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(1) See *B.* Feb. 1912, No. 423. (*Ed.*).

After careful experimental investigation, the Royal Station for the cultivation of Citrus trees at Acireale (Catania) selected and adopted the following formula for practical use.

Lime	1 kg.	10 lbs.
Sulphur	2 kg.	20 lbs.
Water.	10 litres	10 gallons

The writer, the Director of the Station, describes minutely the method of preparing this mixture, which according to him, is a real remedy and serves at the same time as an insecticide and fungicide.

At the request of the Department of Agriculture, the Station has conducted a series of experiments with the object of determining the composition of the mixtures for use in the case of the different scale-insects of Citrus trees, especially in the control of *Chrysomphalus dictyospermi* Mask.

The first series of experiments was made by the writer near Catania, and a second series by the fruit-growers of Sicily (in the provinces of Trapani, Messina, Syracuse, Palermo, Catania) and of the main land of Italy (in the provinces of Salerno, Reggio Calabria and Genoa).

These experiments resulted in the following conclusions:

1) A mixture diluted to 4 % gave the best results in the case of *C. dictyospermi*; the results were good but not yet very reliable, in the case of some other scale insects which infest citrus trees, but negative in that of *Dactylopius* (*pseudococcus*) *Citri*, when the spraying was done in summer. Mixtures of 2 % or 3 % gave bad results, those of 5 % and 6 % have yet to be tried.

2) The best time for spraying is the summer, but this treatment can equally well be carried out when the crop is all gathered before flowering.

3) When the scale insects are very numerous, spraying must be done in good time if damage at flowering-time, or when the fruit ripens is to be prevented. Spraying must not be carried out at blossoming time, or when the buds are young, for fear of scorching. Further, in such cases, especial care must be used in all cultivation (ploughing, manuring, grafting and irrigation).

4) It is impossible to state exactly the number of sprayings necessary; two may be enough, but sometimes four or five are required.

INSECTS INJURIOUS TO VARIOUS CROPS.

754 British India: Bengal

Insect Pests of the Cotton Plant, in Bengal, British India. — See above N. 656.

755 Egypt

The Cotton Boll Worm (*Heliothis armigera*) injurious to the Cotton Plant in Egypt. — See above No. 657.

756

BASSIÈRES, EUGÈNE. ***Delphax Saccharivora*, a pest of the Sugar-Cane in Martinique.** (La maladie de la canne à sucre à la Martinique). — *La Sucrerie indigène et coloniale*, 48e année, tome LXXIX, No. 2, pp. 27-32. Paris, 9 Janvier 1912.

Martinique

At the end of 1910, an insect was observed for the first time in the Commune of Saint-Esprit, upon 15 ha. (37 acres) planted in sugar-cane; its presence was signalised by the withering of the leaves and the more or less complete hindrance of growth.

From this first centre of infection, the pest spread gradually over the island and seriously damaged the sugar-cane crops.

The writer, the head of the agricultural service in Martinique, reports that in October last he was able to ascertain that the damage done in the infected area was due to a *Delphax saccharivora* Westor, one of the Hemiptera well-known to the sugar-cane planters of the neighbouring English Colonies. He states that the propagation of the insect was favoured by three different causes: the carelessness of the cultivators, who neglected the control of the pest on its first appearance; the custom of using large quantities of mineral fertilizers on the plantations, and scarcely ever employing farm-yard manure, and finally, the almost complete absence of insectivorous birds in the sugar cane plantations.

M. Bassières advises the following method of control:

1) When the large or small canes are badly attacked it is necessary, as far as possible, to burn the infected zones. The canes could then be sent to the mill without further trouble.

2. In the case of tall canes, which have suffered less severely and can thus, without much loss, beallowed to grow till the usual

time of harvest, it is sufficient to cut them as soon as possible after burning.

In the mean time, and in inaccessible places a partial burning will be advisable, and also the collection of the eggs of the insect, etc.

3. Young canes, intended to be cut in 1913, and which are, so far, not irremediably affected, should be treated with insecticide.

For this purpose, the writer recommends various emulsions: with petroleum and soap bases according to the American Stations and Hubbard-Riley formulae; with a basis of petroleum and hot milk; bases of soft soap, tobacco juice, sodium carbonate and alcohol; of soft soap und spirits of turpentine; of soft soap and commercial ammonia.

The preparations of petroleum and of ammonia seem to be the most efficacious against the majority of the insects belonging to the same family as *Delphax*.

757

TELLEZ, OLIVERIO. ***Heterodera radicicola*** (1) **on the Roots of Coffee.** (Las Anguillalas de las Raices del Cafeto).—*La Hacienda*, Vol. VII, No. IV, pp. 119-121, 3 figg.; and No. V, pp. 147-148, 1 fig. Buffalo, N. Y., U. S. A., Enero-Febrero 1912.

Mexico: Oaxaca

The writer observed at Teotitlán (Oaxaca) the presence of *Heterodera radicicola* on the roots of coffee. The infection had assumed considerable proportions; in some cases, the plants which were affected quickly succumbed. Hitherto *Heterodera* has been found more or less abundant in the following districts of the State of Oaxaca: Culicán, Teotitlán, Juquila, and Pochutla.

In 16 of the most affected plantations, of Oaxaca, in which the diseased shrubs only amounted to 2 %, the writer calculated that the loss was about $19 125. Every plant which was attacked gave a crop 90 % less in weight than the usual amount. The Liberia, Maragogipe, and Borbón varieties of coffee are, according to the writer, the least subject to this pest. He considers that calcium carbide has, hitherto, given the best result of the numerous remedies which he mentions.

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(1) See *B*. March 1912, No. 587. (*Ed.*)

758 NOEL, PAUL. **Diseases and Parasites of Broad Beans, French Beans, Onions, Leeks and of Celery.** (Les ennemis des fèves et des haricots [*Phaseolus*]. Les ennemies des oignons et poireaux [*Allium*]. Les ennemis du céleri). — *Bulletin du Laboratoire régional d'Entomologie agricole*, 1er trimestre 1912, Janvier-Février-Mars, pp. 4-5 et 7-9. Rouen, 1912.

France

Diseases and parasites of Broad Beans and of French Beans *Bruchus rufimanus* Schk., *B. irresectus* Faohr, (*B. obtectus*), *Aphis* (*Tychea*) *Phaseoli* Pass., *A. Papaveris* Fb., *Mamestra Pisi* Hb,, *Calocampa exoleta* S. V., *Tylenchus devastatrix* Kühn, *Colletotrichum Lindemuthianum* Sacc., *Erysiphe communis* Wallz. *Sclerotinia Libertiana* Fckl., *Uromyces Phaseoli* Wint., *Peronospora Viciæ* Pers,: *Dematophora necatrix* Hartig, *Uromyces Fabae* Pers., *Isariopsis griseola* Sacc

The following is according to the writer a list of the different pests of onions and leeks. *Acrolepia betulella* Curt.; *Lita vigeliella* Dup., *Loxostege sticticalis* L., *Drosophila phalerata* Mg., *Eumerus strigata* Mg., *E. aenea* Mg., *Anthomya ceparum* Mg., *A. furcata* Bé., *A. platura* Mg., *Tylenchus devastatrix* Kühn, *Puccinia Porris* Wint., *Urocystis cepulae* Frost., *Botrytis cana* Sor., *Peronospora Schleideni* Ung.

The writer mentions the following parasites and diseases of the celery: *Papilio machaon* L., *Mamestra dysodea* S V., *M. chenopodi* S. V., *Agrotis plecta* L., *Aspilatus* (*Diastictis*) *artesiana* S. V., *Oecophora minutella* Mus. Schiff., *Tripeta Heraclei* Lw,, *Piophila Apii* Westw., *Cercospora Apii* Fr.

759 TRABUT. **The "Khamedj" of the Date Palm.** (Le Khamedj du dattier dû au *Phoenicococcus Marlatti*). — *Comptes rendus hebdomadaires des séances de l'Academie des Sciences*, Tome 154, No. 5, pp. 304-305. Paris, 29 Janvier 1912.

Algeria. Tunis

"Khamedj", or rottennes of the date bunches, is considered by the natives who cultivate the oases of the Algerian and Tunisian Sahara, to be the worst disease which attacks the date-palm; the percentage of trees affected is 5 %.

The disease makes its appearance a short time after fertilization; the bunch withers before developing. The writer studied "Khamedj" carefully during December, and found (as in the observations of W. Swingle) that all the date-palms were badly infested by a scale-insect, *Phoenicococcus Marlatti* Cock., which lives in rather large colonies at the base of the lower swollen parts of the leaves and at the bases of the spathe and the bunches.

Trade in the shoots of this plant has carried the parasite to the coast of the Algerian Tell, to Australia and America. *Phoenicococcus Marlatti* is also to be found in Egypt and probably in all the oases of Africa and Asia. Plants grown from seed are free from this enemy.

Sulphuring in spring, at the time of fertilisation, prevents the young migratory larvae from finding their way to the date-bunches.

The date-palm is often very seriously injured by another scale-insect, *Parlatoria Blanchardi*, which is very different from *Phoenicococcus*.

Insect Pests of the Avocado in Hawaii. — See above, No. 669. **760** **Hawaii**

FROGATT, WALTER W. **A Weevil, *Aesiotes leucurus*, Pascoe, destructive to Pine Trees, *Pinus halepensis*.** — *The Agric. Gazette of New South Wales*, Vol. XXIII, Part 1, pp. 55-56 1 Plate. Sydney, January 2, 1912. **761**

The writer mentions that *Pinus halepensis* has been much injured by *Aesiotes leucurus*; the trees were infested with the larvae, pupae, and perfect beetles in all stages of development. The larvae, when full-grown, eat a shallow cavity in the sap-wood. The insects could have been killed, under the bark had they been noticed when they first appeared, by tapping them out with a small chisel or gouge. The trees may recover this season, but if the larvae and pupae in the timber at the present time emerge, next season will certainly end the life of the trees. **N. S. Wales**

The writer proposes that the adult beetles should be trapped on the tree trunks by putting bandages or sheltering places for them to hide in during the day, where they could be sought, collected and destroyed.

OL, J. A. **Injury caused to the Larch, by *Coleophora laricella* in Russia** (1). (Listvennitcnaia Mol, *Coleophora laricella* Hbn.).— *Xurnal Boliesni Rastenii* (Journal of Plant Diseases), V. G., No. 5-6, pp. 136-139, S 2 ris. v tek. (with two figures in the text). S. Peterburg, 1911. **762**

In many districts of Russia proper, and also in extensive zones in Finland, the larches are often much injured by *Coleophora lari-* **Russia**

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(1) See also *B.* March 1911, No. 987. (*Ed.*)

cella Hbn. The female of this insect, when fertilised, deposits its eggs, which are of a yellow colour, on the leaves of the larch; the larvae hatch out in a few days and penetrate into the tissue which they devour or deform

The leaves which are thus attacked, wilt, shrivel up and fall, and when the number of larvae is considerable, the growth of the trees is almost stopped ; death sometimes ensues. Amongst the enemies of this insect may be mentioned some endophagous hymenoptera which destroy the larvae, and birds, which live on the adult insects Meteorological conditions further can contribute to the destruction of *Coleophora* ; thus, an early spring causes the larvae to hatch out before the larch buds, which form their exclusive food, have unfolded; late frosts destroy the young leaves and the larvae within them, while stormy weather in May prevents the females laying their eggs.

INJURIOUS VERTEBRATES

768 **Destruction of Sparrows** (1). (Gegen die Sperlingsplage) — *Schweizerische Landwirtschaftliche Zeitschrift*, XL Jahrg., Heft 5., S. 103-104, Fig. 19. Zürich, 2 Februar 1912.

Switzerland

For dealing with Sparrows, the use of artificial nests is recommended. These should be made of strong pottery and suspended, up to the beginning of April at the latest, from roofs, huts, houses, etc., about 8 ft., from the ground.

The nests should be inspected every fortnight and the eggs removed.

These nests are sold at from 0.60 to 0.70 fr. (5 ³/₄ *d* to 6 ³/₄ *d*) each.

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(1) See *B*. Jan. 1912, No. 271. (*Ed.*).

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

MONTHLY BULLETIN
OF AGRICULTURAL INTELLIGENCE
AND PLANT DISEASES

INDEX

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PREFACE

This index, though arranged alphabetically, retains the grouping of the subjects used in the *Monthly Bulletin*. The arrangement of the subjects in each group is in chronological order of publication, except in the case of those relating to Agricultural Development, where the alphabetical arrangement was considered more useful.

Except in the case of the original articles, which are numbered according to their pages, the numbers of each subject refer to the paragraphs in the *Monthly Bulletin*.

The index consists of three parts: one, of the original articles, one concerned only with Agricultural Intelligence and the last with Plant Diseases.

This volume of contents has been prepared by the redacteurs Dr. Giulio Provenzal and Prof. Giulio Trinchieri.

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